
CEV-RZ/A1L Linux SDK (V2.00.00 or later)

installation guide

(Third Edition)

Before use

Thank you for purchasing CEV-RZ/A1L.

Read this manual thoroughly before attempting to use the CEV-RZ/A1L Linux SDK.

- In the event of exporting the product (including taking it outside of Japan) or supplying the software to third parties not resident in Japan, make sure that all procedures as stipulated by the Foreign Exchange and Foreign Trade Act are strictly observed.
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Chapter 1 Introduction

1.1 Introduction

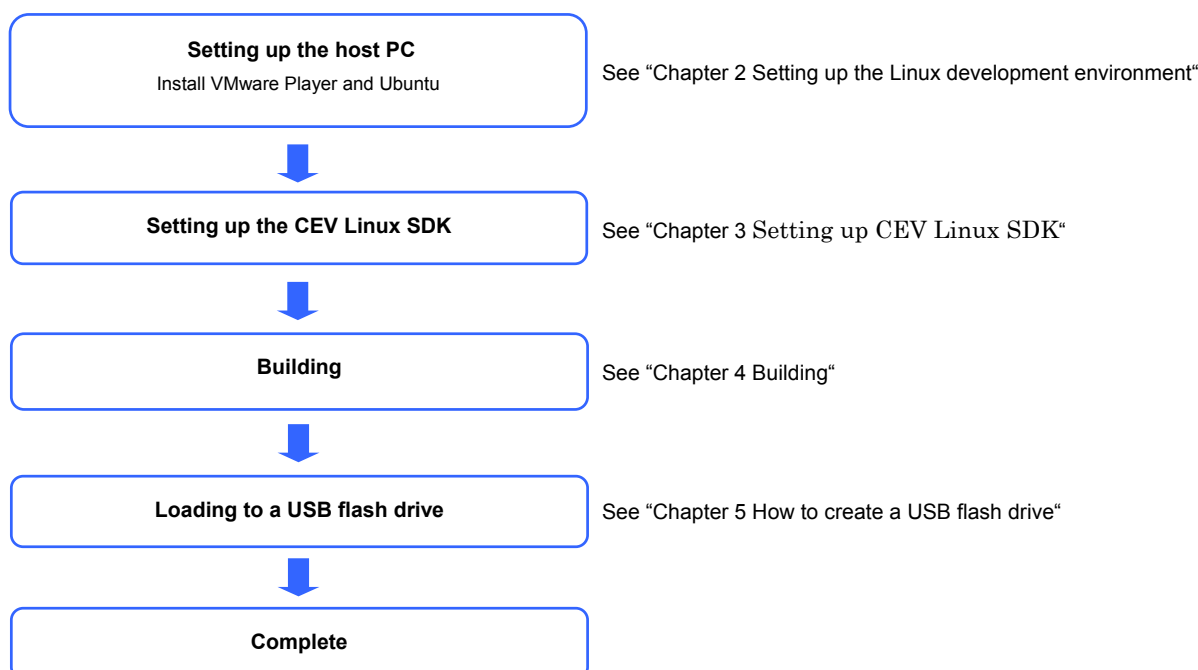
This manual (CEV-RZ/A1L Linux SDK Installation Guide) describes how to install CEV Linux SDK, an embedded Linux development environment, which runs on the CEV-RZ/A1L evaluation board that is based on the Renesas Electronics RZ/A1L (Cortex-A9 core 400 MHz) microcontroller. This manual refers to CEV Linux SDK V2.00.00 or later.

For development with the CEV Linux SDK, you first need to install Ubuntu, a Linux host, as a virtual machine on the host PC (Windows PC) to build a cross-development environment.

To build a development environment, you also need the following software in addition to that provided in the CEV Linux SDK:

- VMware Player Ver5.0.2 (VMware-player-5.0.2-1031769.exe)
Download this software from the following site:
<http://www.vmware.com/jp/>
- Ubuntu 12.04.3 LTS (Precise Pangolin) (ubuntu-12.04.3-desktop-i386.iso)
Download this software from the following site:
<http://releases.ubuntu.com/>

The following procedure is used to set up and build the CEV Linux SDK, and then load it to a USB flash drive:



"Chapter 9 Debugging using PALMiCE3" describes how to debug using PALMiCE3 (sold separately).

1.2 Equipment required

This section describes the equipment required to run embedded Linux on the CEV-RZ/A1L board.

- **CEV-RZ/A1L board**

This product. U-Boot starts at power on because U-Boot is pre-loaded into the on-board SPI flash by default.

All of the following equipment is sold separately. These need to be obtained by the customer.

- **USB cable**

This is required to run Linux on the CEV-RZ/A1L board. It is used for performing input/output to the console for U-Boot and Linux.

Prepare a standard USB2.0 A to Mini-B cable.

- **USB flash drive**

This is required to run Linux on the CEV-RZ/A1L board. The Linux kernel and file system are loaded onto it.

Prepare a USB2.0 flash drive (32 MB or more).

- **Sensors**

The CEV-RZ/A1L board has expansion slots for installing and evaluating sensors.

For details on these sensors, see “CEV-RZ/A1L Hardware Manual”.

- **Workstation PC**

For details on the specifications, see “1.4 Operating Environment”.

- **VMware Player**

The use of VMware Player V5, or V6 or later is recommended.

Install it on the workstation PC on which the Linux development environment is established (Linux host).

Download it beforehand if the host PC cannot connect to the Internet.

- **Ubuntu 12.04 LTS**

The use of Ubuntu 12.04 LTS is recommended.

The following description assumes the use of a Linux host. Install it on the virtual machine established with VMware Player.

Download it in advance, along with the package required for development, if your host PC cannot connect to the Internet.

1.3 Command syntax

This section describes the syntax used in this manual.

The command syntax is defined as follows:

Command syntax	Description
WINPC> command parameter ...	Indicates commands that are executed on the Windows host PC.
ubuntu@ubuntu:~\$ command parameter ...	Indicates commands that are executed on the Linux host (Ubuntu).
U-BOOT> command parameter ...	Indicates U-Boot commands that are executed on the CEV board console.
CEV # command parameter ...	Indicates Linux commands that are executed on the CEV board console.

Command execution requires root privileges if the command prompt is "#" or user privileges when it is "\$" on the Linux host and the CEV-RZ/A1L board. Execution with root privileges is possible using sudo commands with user privileges.

1.4 Operating Environment

The following environment is required to install VMware Player and Linux host:

■ Operating Environment

Host computer	PC capable of running the appropriate OS	Note
CPU	2 GHz or better Intel Core i series (2 or more cores)	
Memory	4 GB or more	
HDD	500GB or more	20 GB or better is recommended for the virtual disk size for Ubuntu.
DVD drive	DVD-R reader	Required for installation.
USB	USB2.0	
LAN interface	100BASE-TX or better 100BASE-TX is recommended for the CEV-RZ/A1L.	You need to be able to connect to the Internet in order to download the development software (such as a Linux package).
OS	Windows XP	Service Pack 1 onward. Supports 32-bit version.
	Windows Vista	Supports 32-bit version.
	Windows 7	Supports 32-bit version and 64-bit version.
	Windows 8	

For details on the necessary PC specifications when using PALMiCE3, see "PALMiCE3 User's Manual".

This manual assumes the use of Windows 8.

1.5 Support community

For technical questions and information about the CEV-RZ/A1L board, access the CEV-RZ/A1L product support community from our homepage.

CEV-RZ/A1L product information

<http://www.computex.co.jp/eg/products/cev/>

CEV-RZ/A1L product support community

http://www.computex.co.jp/forum/cev_rz_a1l.htm

1.6 Changes to CEV/RZ/A1L Linux SDK V2

This version incorporates the following major changes relative to CEV Linux SDK V2.00.00:

1. "buildroot-2013.05" was upgraded to "buildroot-2013.08.1".
The sources compiled by buildroot have been upgraded.
2. The tool chain was changed to support building using sources from the linaro compiled binary.
The time required for compilation varies because everything is compiled from sources.
3. Ad-hoc mode was removed and access point mode was added to the wireless LAN (CM-J100) operation modes.
The setting method for wireless LAN in web applications has been changed accordingly.

Chapter 2 Setting up the Linux development environment

2.1 Introduction

This chapter describes the software required to build a Linux development environment (Linux SDK) running on the CEV-RZ/A1L.

It is common to use a Linux PC to develop the software for an embedded Linux application. However, this chapter describes the installation of VMware Player to set up a virtual PC on a Windows PC, followed by the installation of Ubuntu as a Linux host on that virtual PC.

It also describes how to install Tera Term for Windows to act as the console terminal for the CEV-RZ/A1L.

2.2 Downloading

Download the software required to build the Linux development environment.

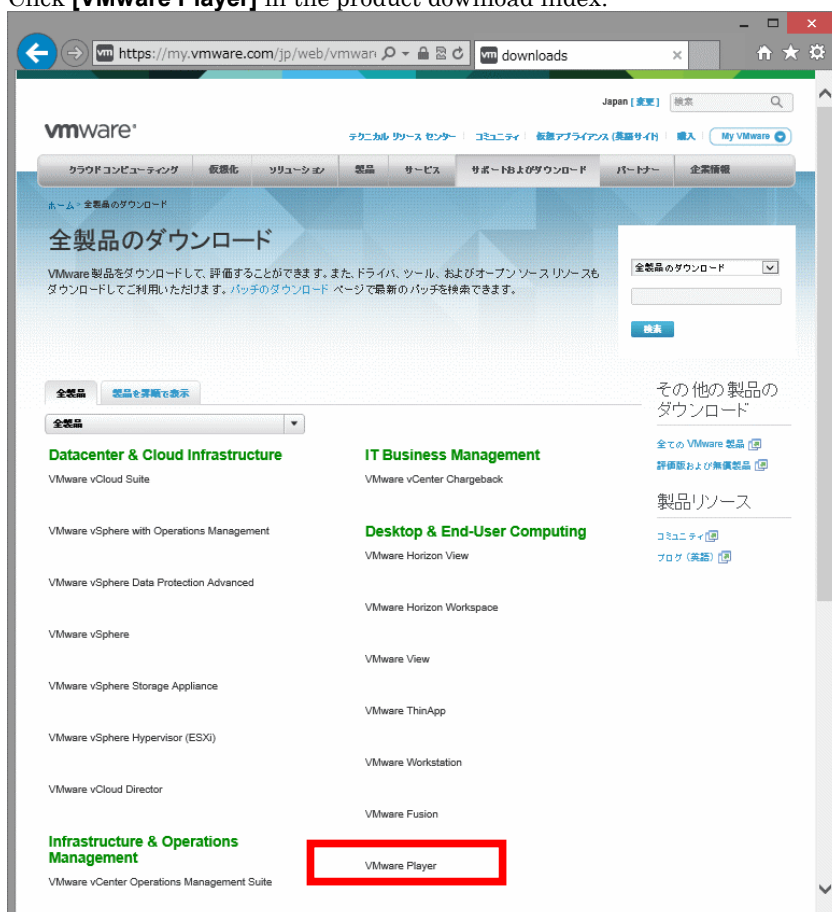
1. VMware Player for Windows 32-bit and 64-bit
2. Ubuntu 12.04.3 LTS (Precise Pangolin) PC (Intel x86) install/live DVD
3. Tera Term 4.78

2.2.1 Downloading VMware Player

Download VMware Player as described below:

1. Open your browser and enter the following URL:
<https://my.vmware.com/web/vmware/downloads>

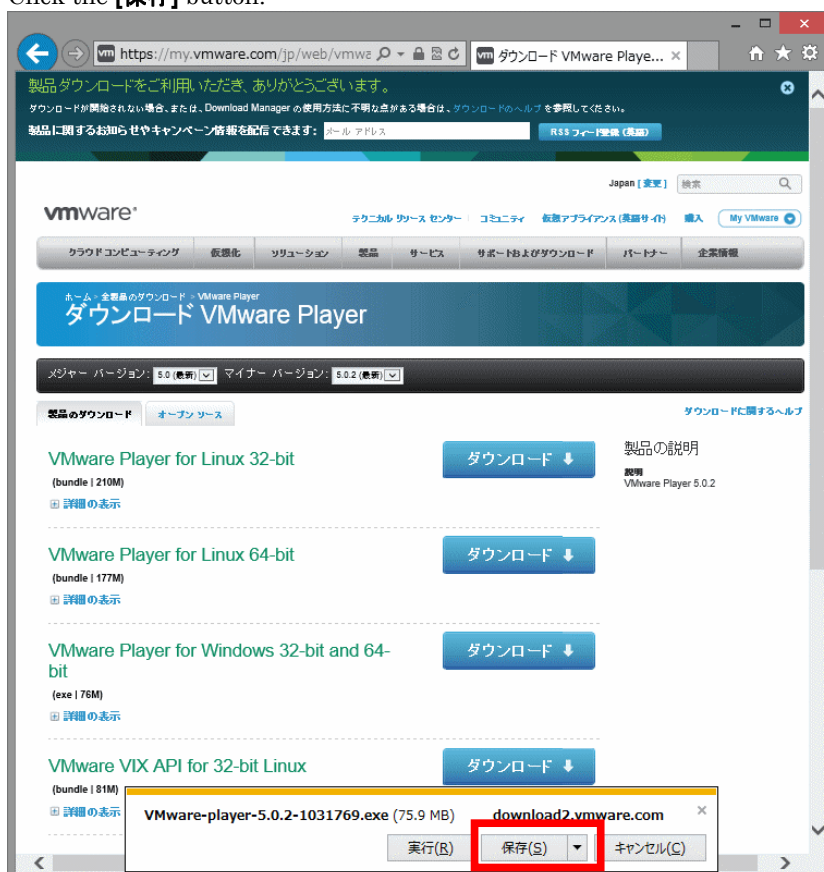
- Click **[VMware Player]** in the product download index.



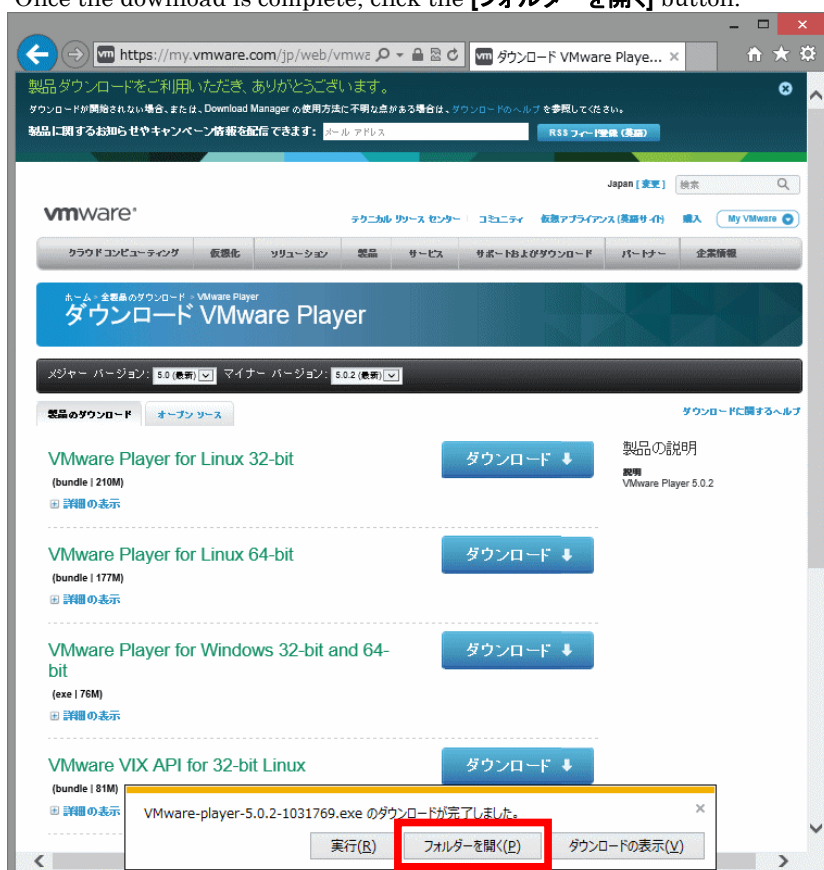
- Click Download for **[VMware Player for Windows 32-bit and 64bit]**.



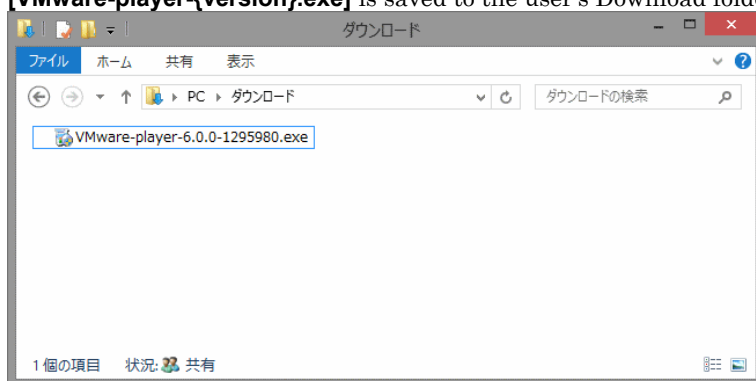
- Click the **[保存]** button.



- Once the download is complete, click the **[フォルダーを開く]** button.



6. **[VMware-player-{version}.exe]** is saved to the user's Download folder.



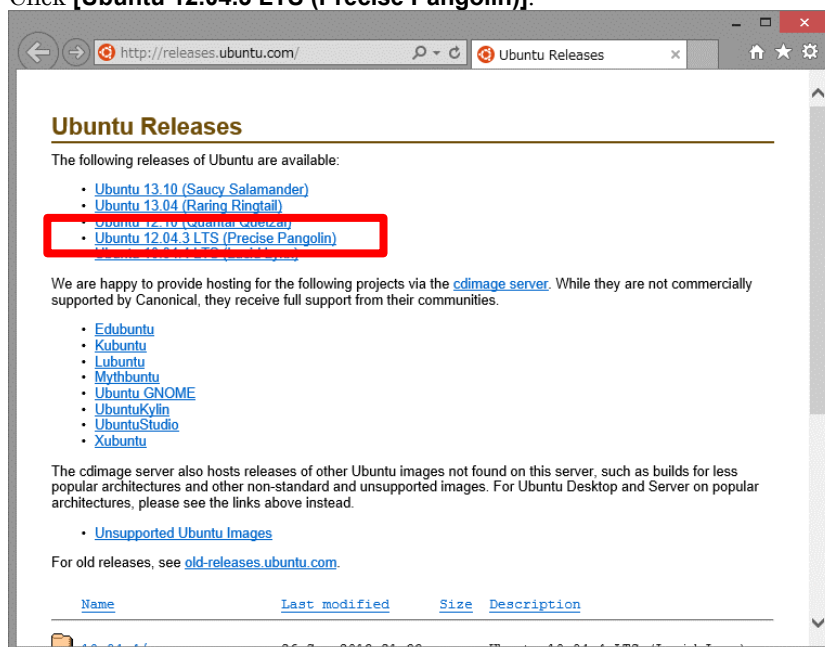
2.2.2 Downloading Ubuntu

Download Ubuntu as described below:

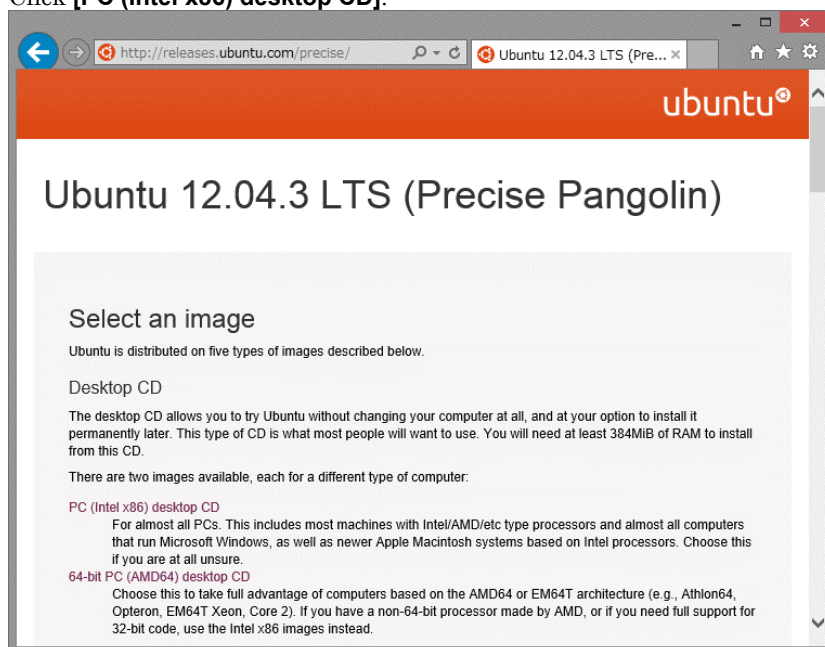
1. Open your browser and enter the following URL:

<http://releases.ubuntu.com/>

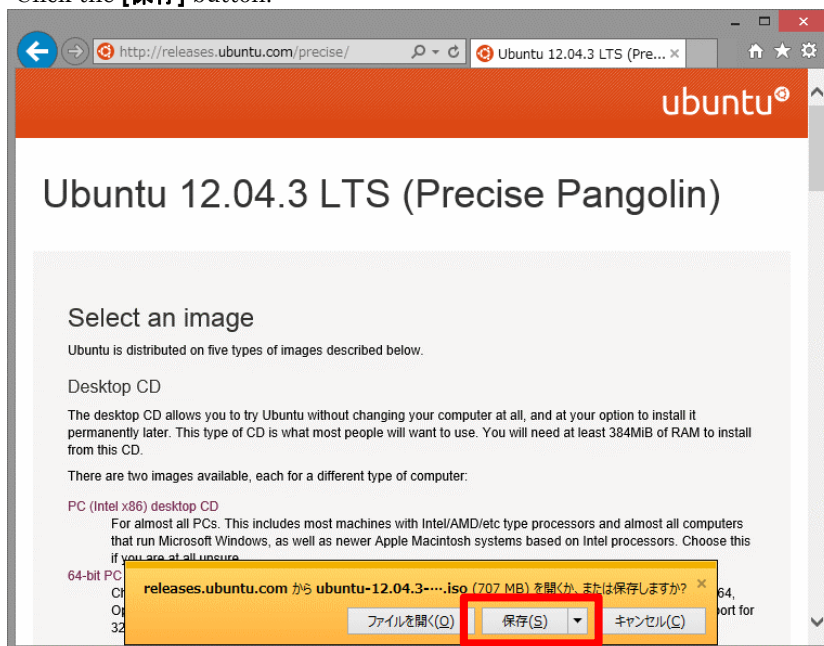
2. Click **[Ubuntu 12.04.3 LTS (Precise Pangolin)]**.



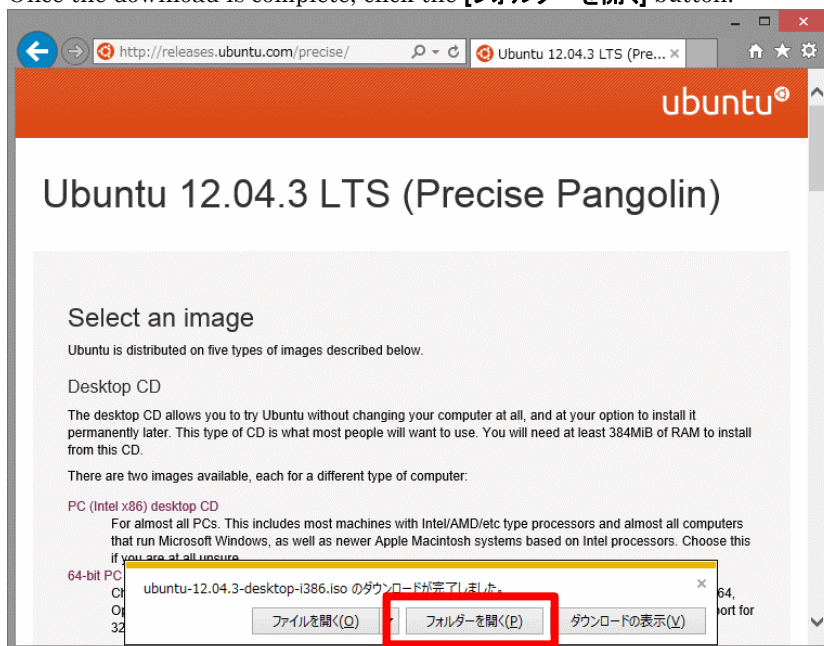
3. Click **[PC (Intel x86) desktop CD]**.



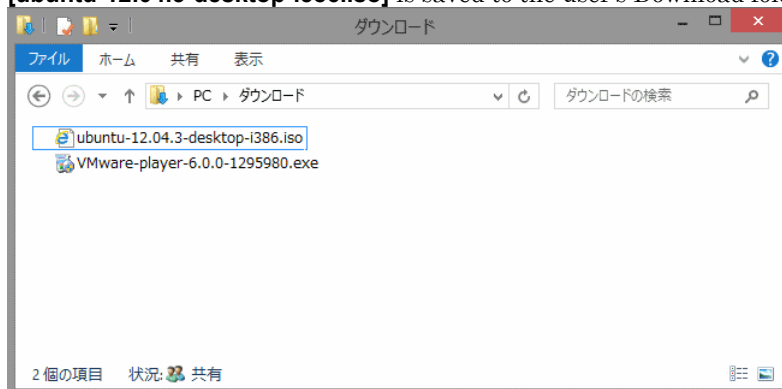
- Click the **[保存]** button.



- Once the download is complete, click the **[フォルダーを開く]** button.



- [ubuntu-12.04.3-desktop-i386.iso]** is saved to the user's Download folder.



2.2.3 Downloading Tera Term

Download Tera Term as described below:

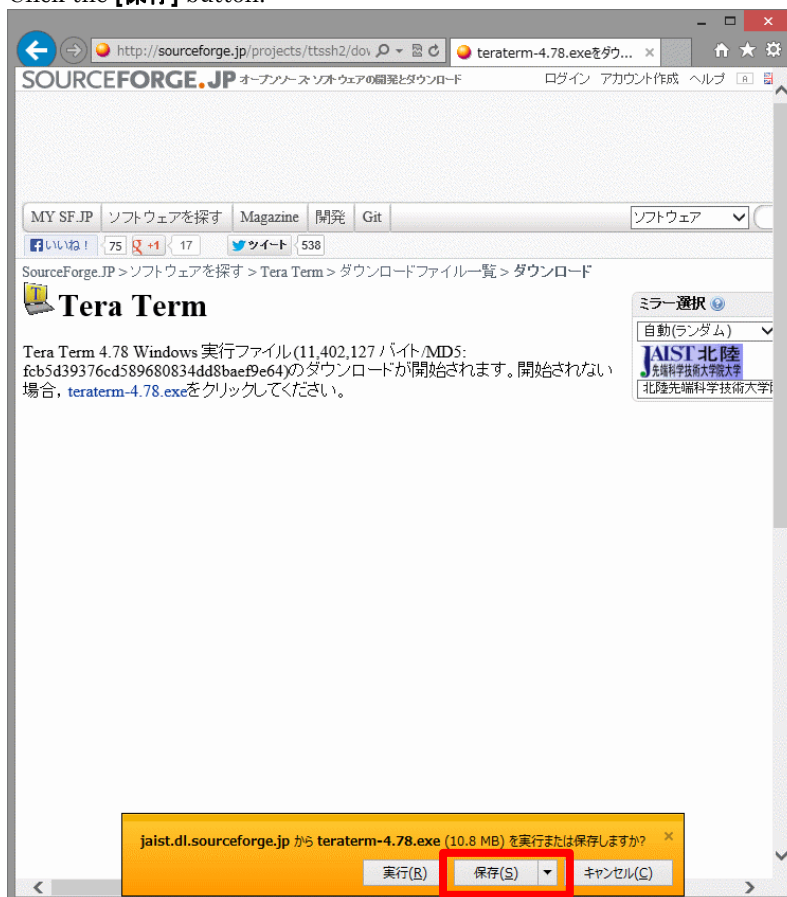
1. Open your browser and enter the following URL:
<http://tssh2.sourceforge.jp/>
2. Click **[ダウンロード]** to move to the download page.



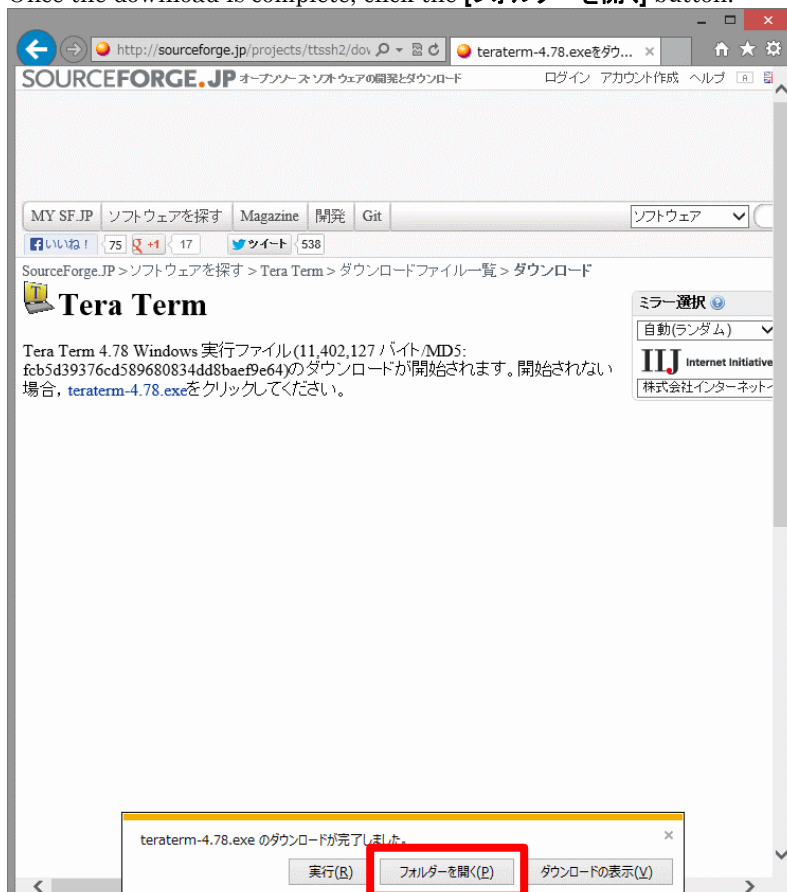
3. Click **[teraterm-4.78.exe]** from **[リリースファイル一覧]**.



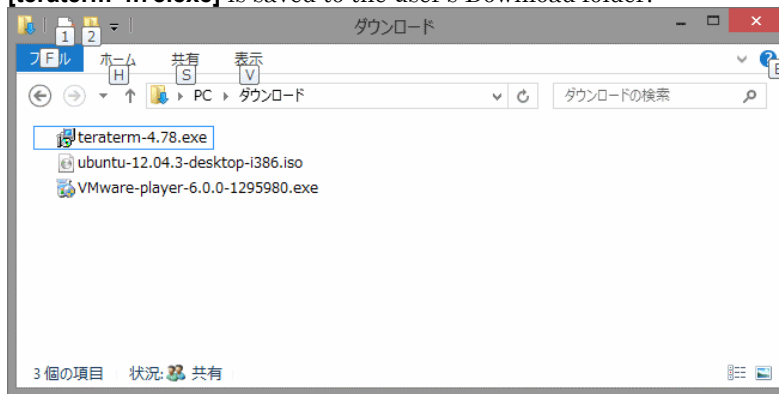
4. Click the **[保存]** button.



5. Once the download is complete, click the **[フォルダーを開く]** button.



6. **[teraterm-4.78.exe]** is saved to the user's Download folder.



All of the above software is of the latest version as of October 2013.

The homepage and software described in this manual are subject to change without notice.

The Windows PC software to be used as the development environment has been downloaded.

2.3 Installing and setting up

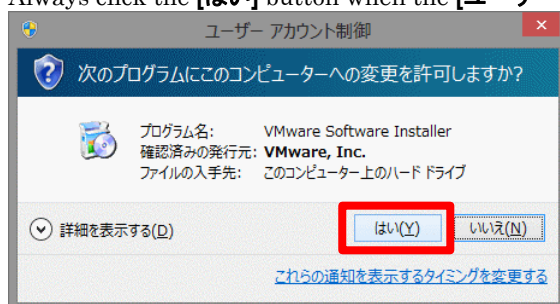
Install the downloaded software.

2.3.1 Installing VMware Player

Install VMware Player to enable the installation of multiple OSs on the Windows PC.

Install VMware Player as described below:

1. Run **[VMware-player-{version}.exe]** from the Download folder.
2. Always click the **[はい]** button when the **[ユーザー アカウント制御]** dialog box appears.



3. Click the **[次へ]** button.



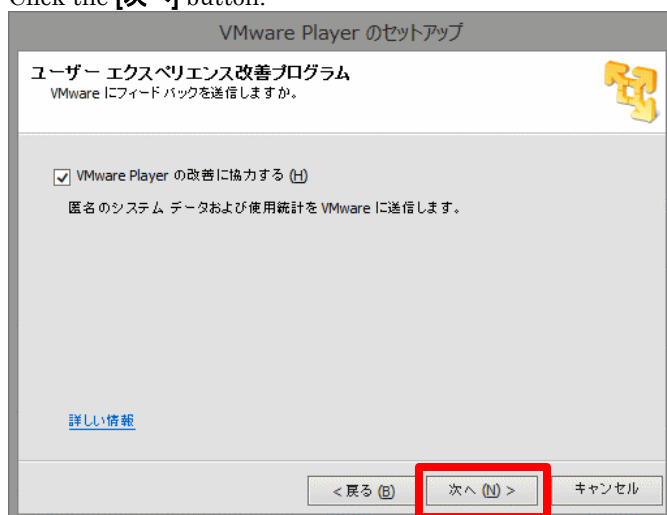
4. Specify the install location or click the **[次へ]** button.



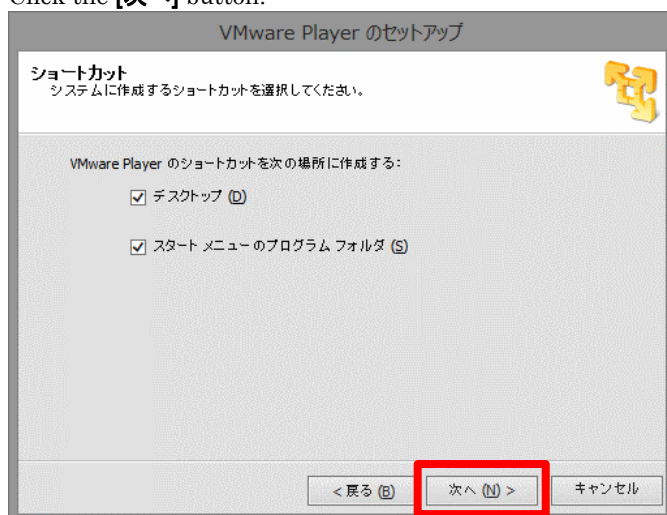
5. Click the **[次へ]** button.



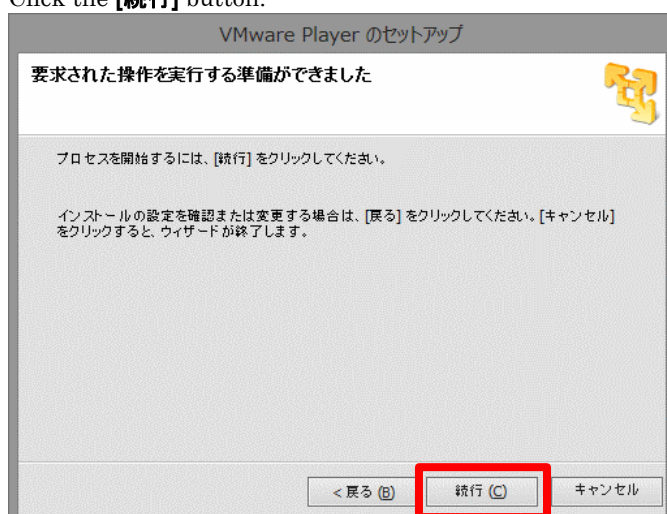
6. Click the **[次へ]** button.



7. Click the **[次へ]** button.



8. Click the **[続行]** button.



9. Once setup is complete, click the **[完了]** button.



2.3.2 Installing and setting up Ubuntu

Install “Ubuntu” on the virtual PC enabled with VMware Player, installed as described in the previous section.

“Ubuntu” is a Linux-based desktop distribution.

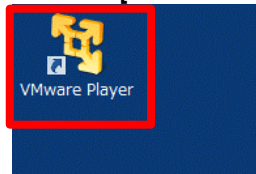
In this case, install “Ubuntu 12.04 LTS” for Windows.

LTS, preceded by the version number, stands for “Long Term Support”.

The latest LTS version as of November 2013 is “Ubuntu 12.04 LTS”, which will be supported until April 2017.

Install Ubuntu through VMware Player as described below:

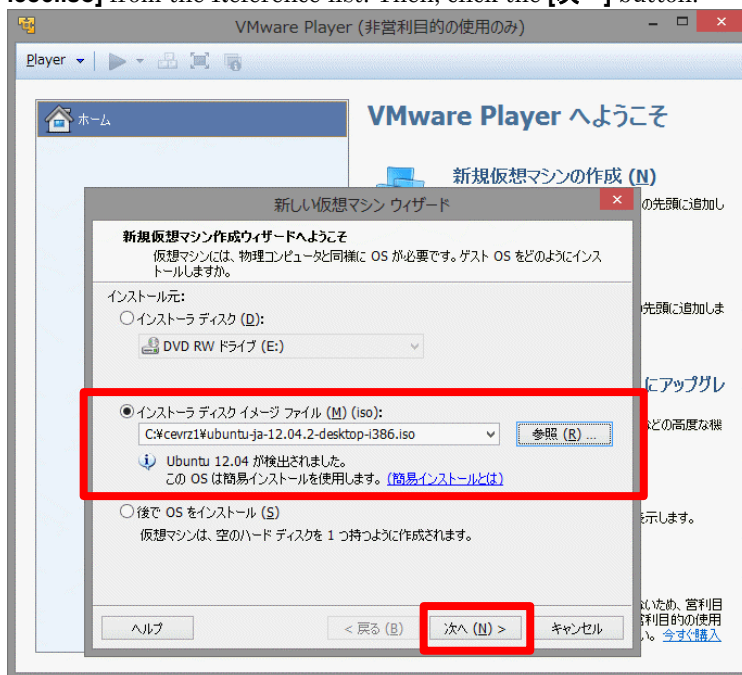
1. Click the **[VMware Player]** icon created on the desktop.



2. After launching VMware Player, click **[新規仮想マシンの作成]** in the right pane.



3. Click the Installer Disc Image File, and then select the pre-downloaded [ubuntu-ja-12.04.2-desktop-i386.iso] from the Reference list. Then, click the [次へ] button.

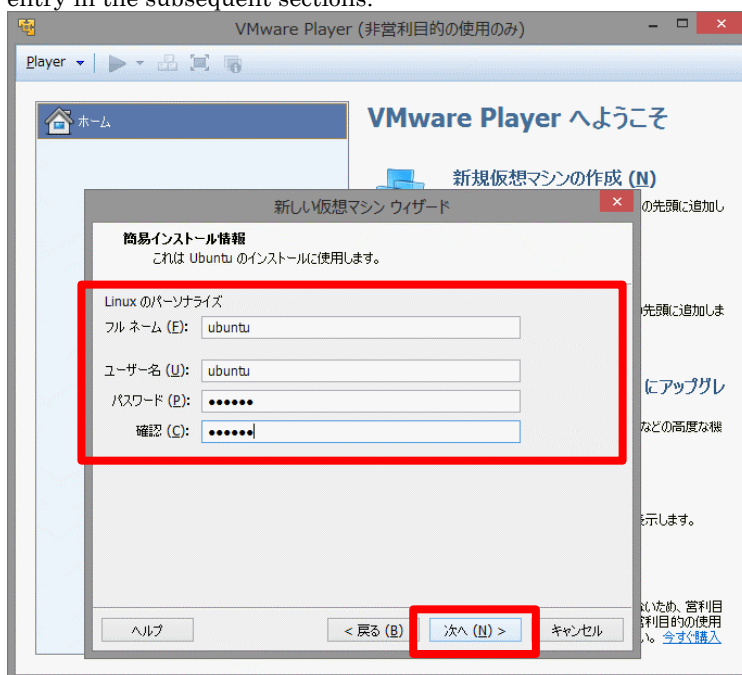


4. The New Virtual Machine Wizard dialog box opens.

In this case, enter “ubuntu” in the User Name (full name) and Password fields.

Take care when entering “ubuntu” in the Password field because it is displayed as a sequence of [●●●●●●●●].

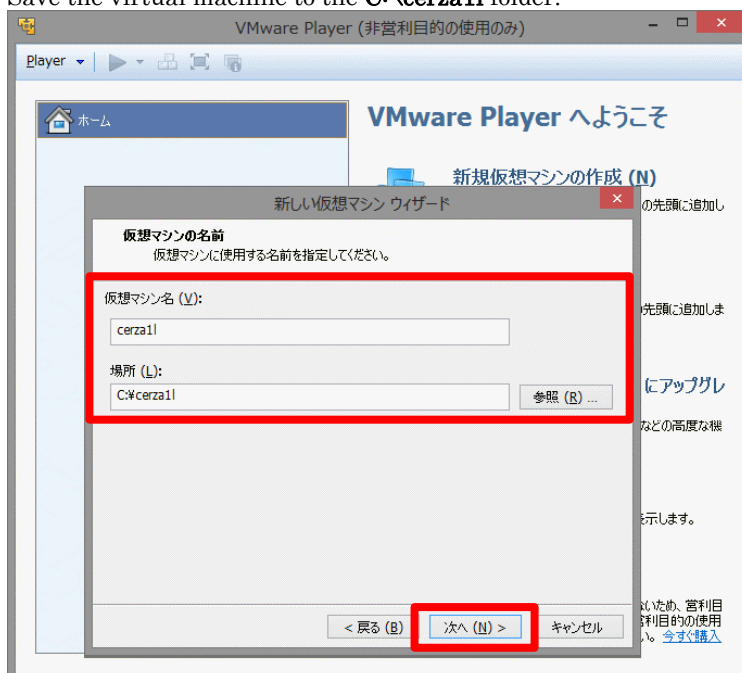
If you choose to enter a different user name and password, use it for the Ubuntu user name and password entry in the subsequent sections.



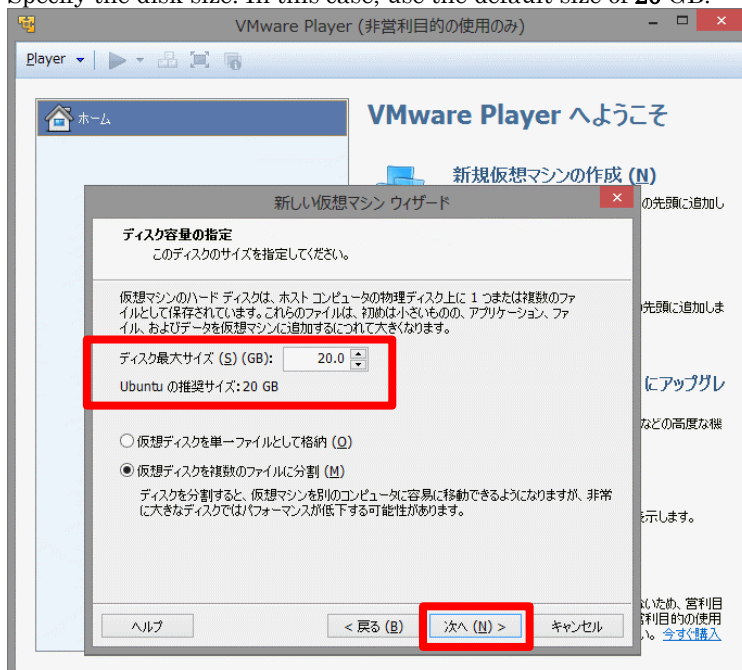
5. Specify the virtual machine name and save location.

The virtual machine name is “**cerza11**”, an abbreviation for the CEV-RZ/A1L board.

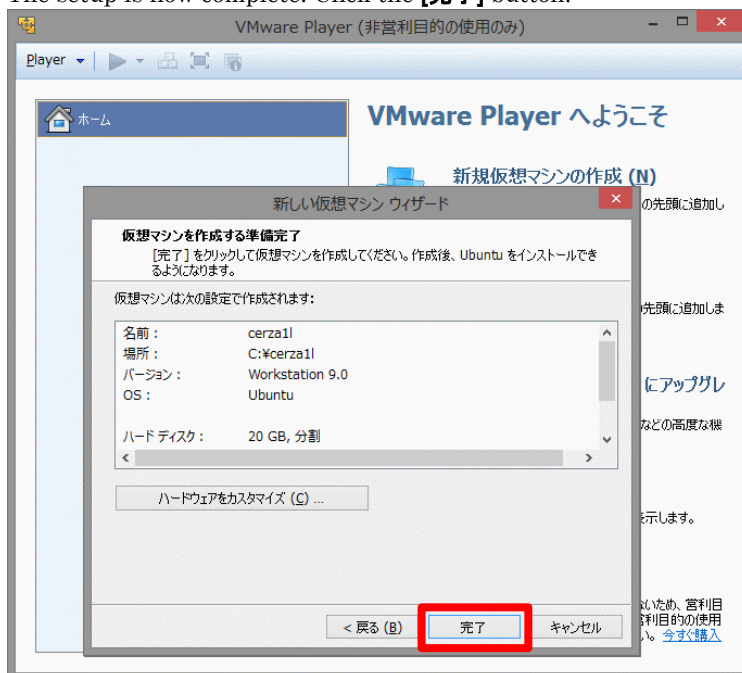
Save the virtual machine to the **C:\cerza11** folder.



6. Specify the disk size. In this case, use the default size of 20 GB.



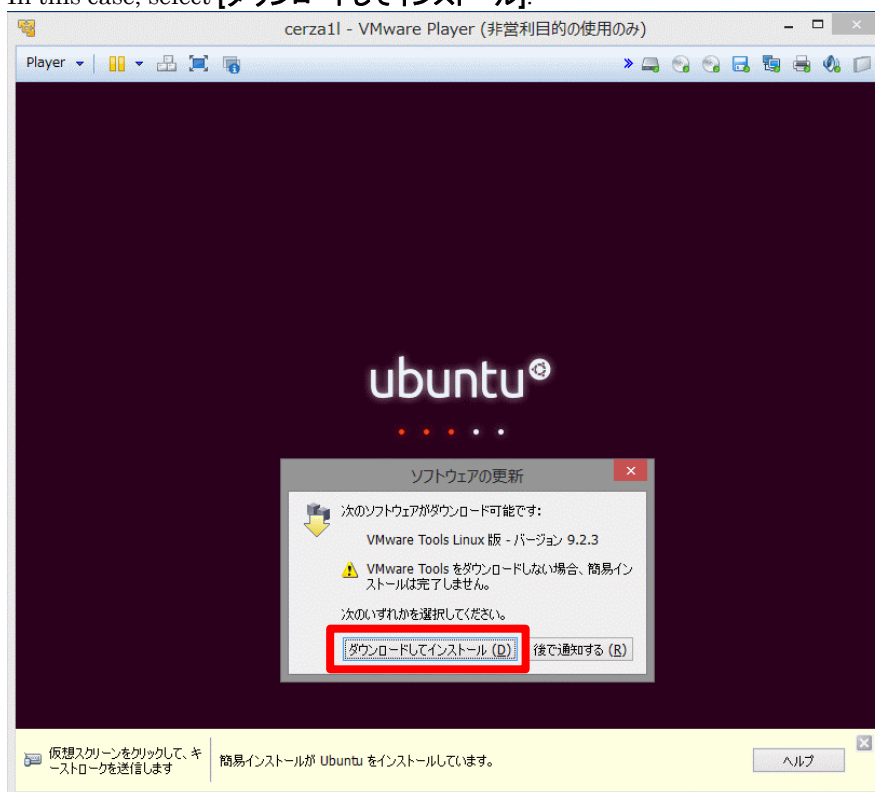
7. The setup is now complete. Click the **[完了]** button.



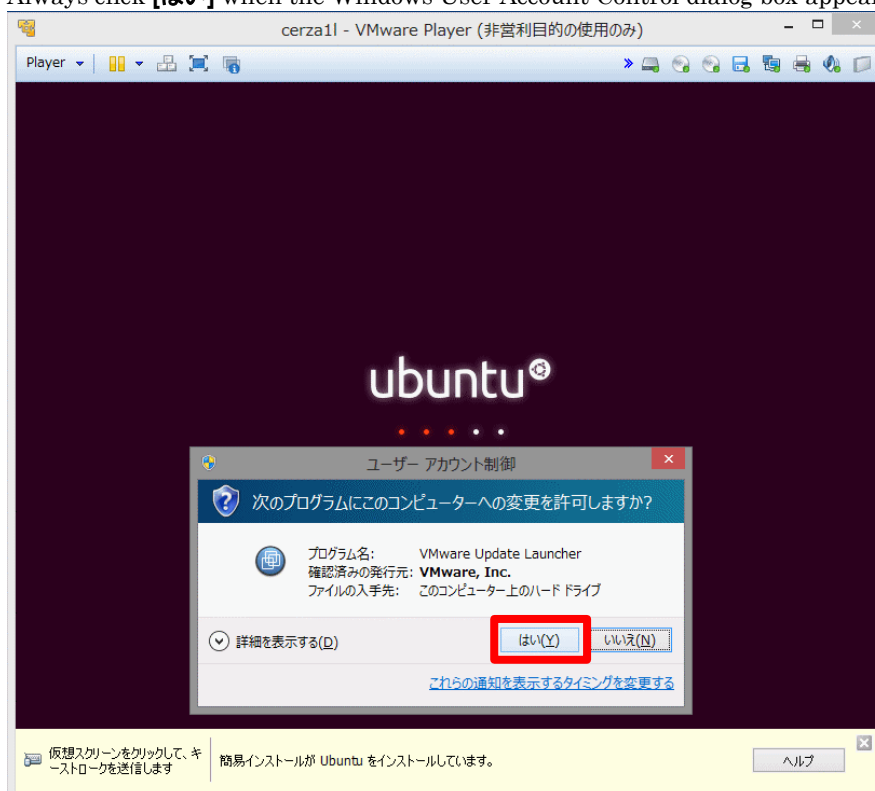
8. The installation of Ubuntu starts.

During the installation, the **[ソフトウェアの更新]** dialog box appears.

In this case, select **[ダウンロードしてインストール]**.



9. Always click **[はい]** when the Windows User Account Control dialog box appears for confirmation.



10. Ubuntu is now being installed.



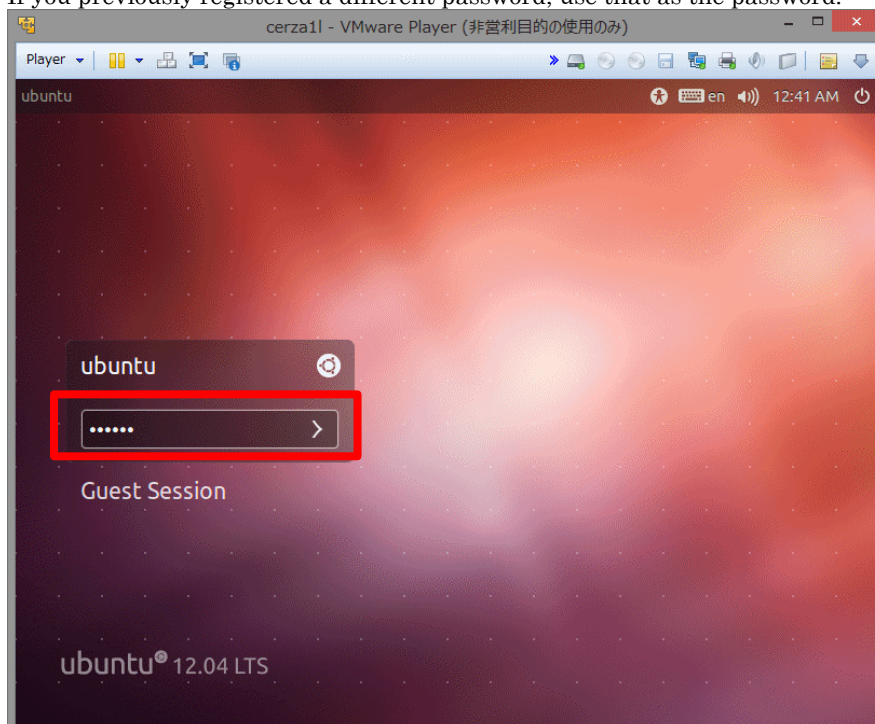
11. Once the Ubuntu installation is complete, the log-in screen appears.

Enter the registered password.

In this case, enter “**ubuntu**” for the password (same as the user name).

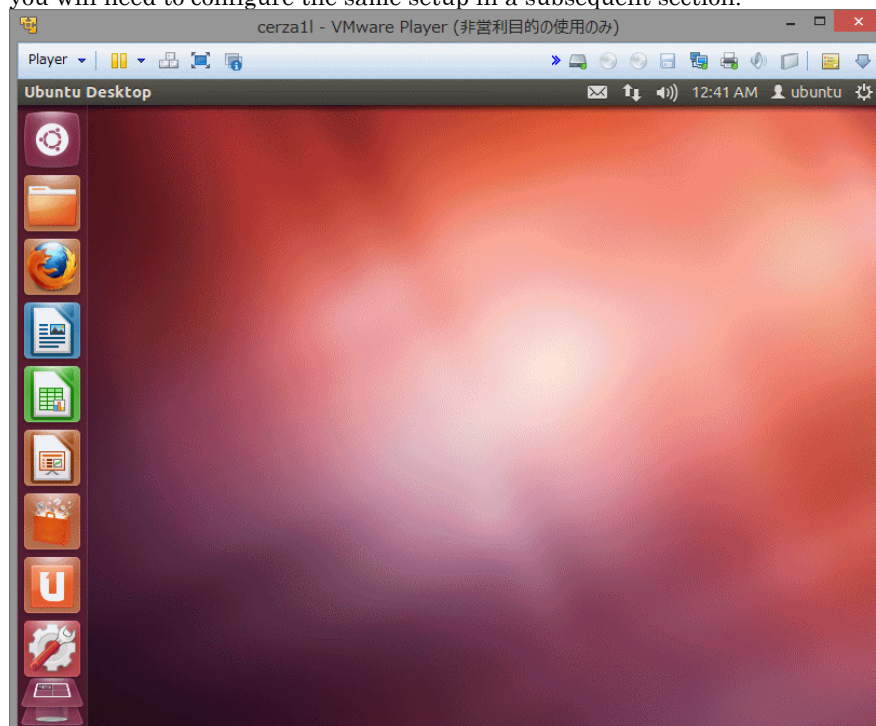
Take care when entering the password because it is displayed as a sequence of [●●●●●●●●].

If you previously registered a different password, use that as the password.



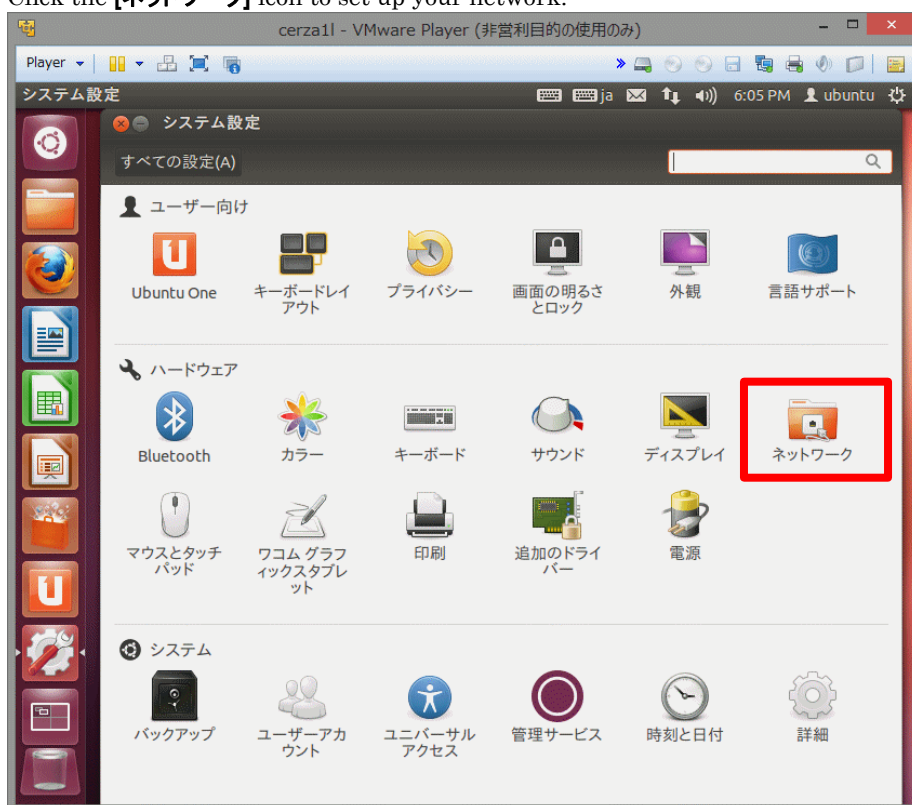
12. You have successfully logged into the desktop screen of Ubuntu.

The **[Update information]** dialog box may appear after a while, but click **[Close]** to ignore this box because you will need to configure the same setup in a subsequent section.

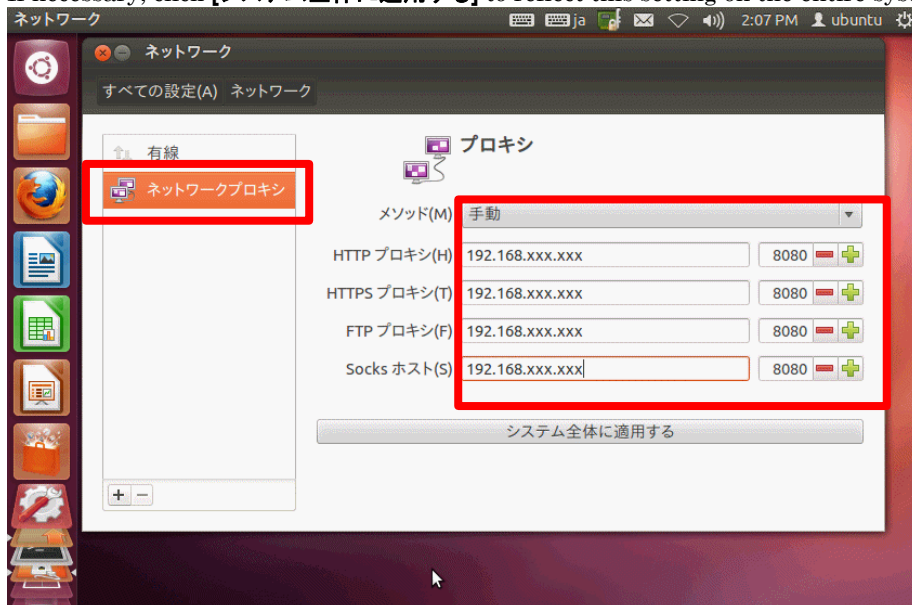


The Ubuntu environment has been established.

13. You may need to set up your network proxy to connect to the Internet.
For detailed information about your network environment, contact your network administrator.
Click the **[ネットワーク]** icon to set up your network.



14. To setup a proxy, click **[ネットワークプロキシ]** to perform manual setup depending on your network.
If necessary, click **[システム全体に適用する]** to reflect this setting on the entire system.



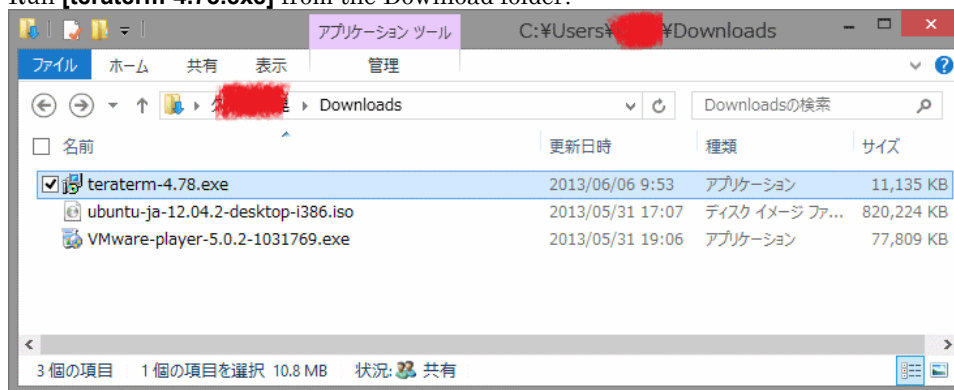
Close the System Settings window to display the desktop.
The Ubuntu setting is now complete.

2.3.3 Installing Tera Term

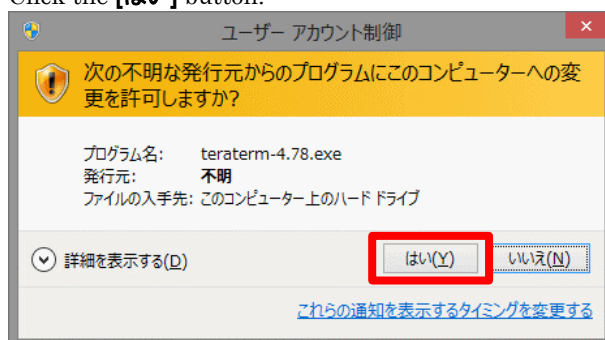
Free software called “Tera Term” for Windows is used as a terminal emulator to support serial connection. It is used as a serial terminal (console) on this board.

Install Tera Term on your Windows PC as described below:

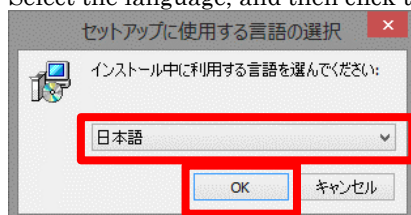
1. Run **[teraterm-4.78.exe]** from the Download folder.



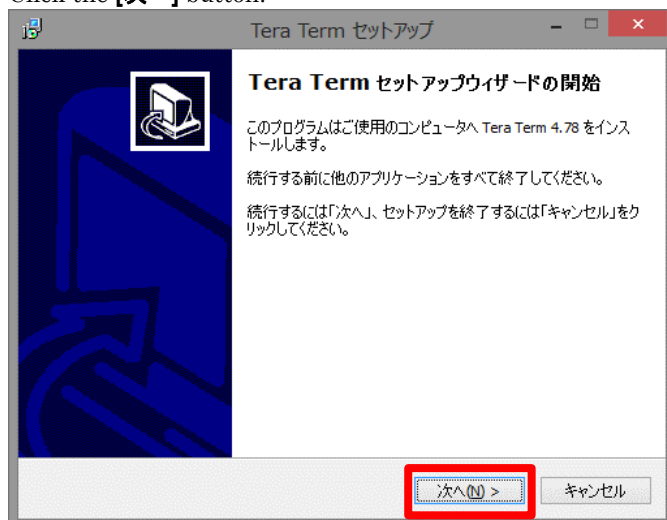
2. Click the **[はい]** button.



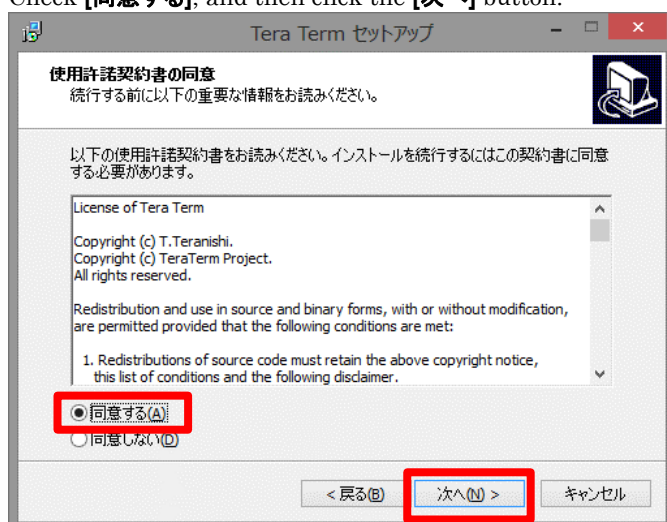
3. Select the language, and then click the **[OK]** button.



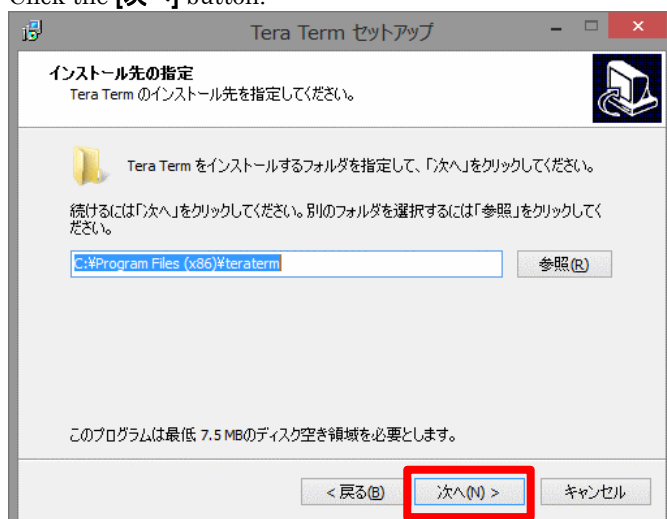
4. Click the **[次へ]** button.



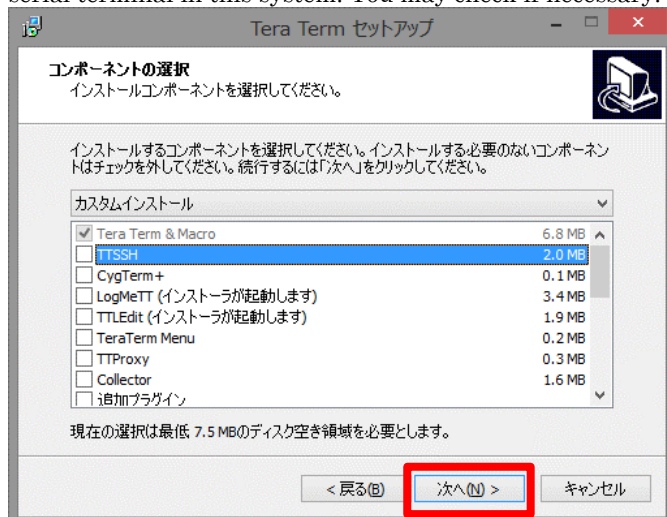
5. Check **[同意する]**, and then click the **[次へ]** button.



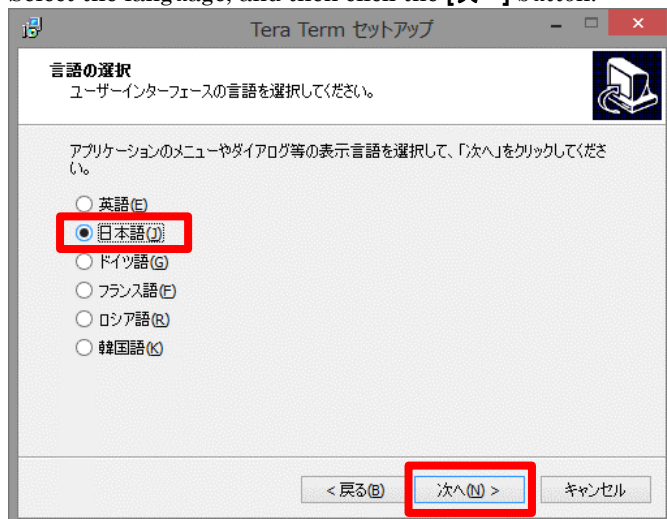
6. Click the **[次へ]** button.



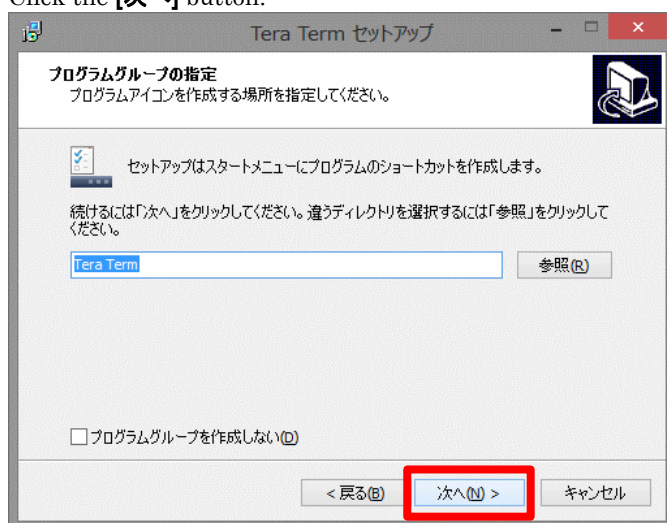
7. Uncheck all except **[Tera Term & Macro]** in **[カスタムインストール]** because Tera Term is only used as a serial terminal in this system. You may check if necessary.



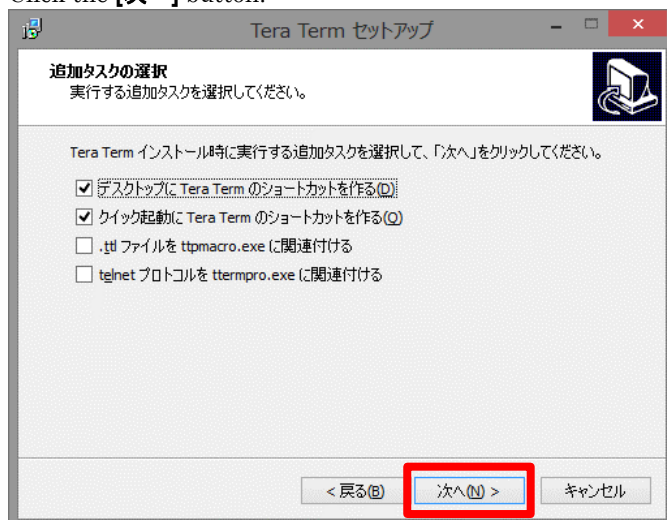
8. Select the language, and then click the **[次へ]** button.



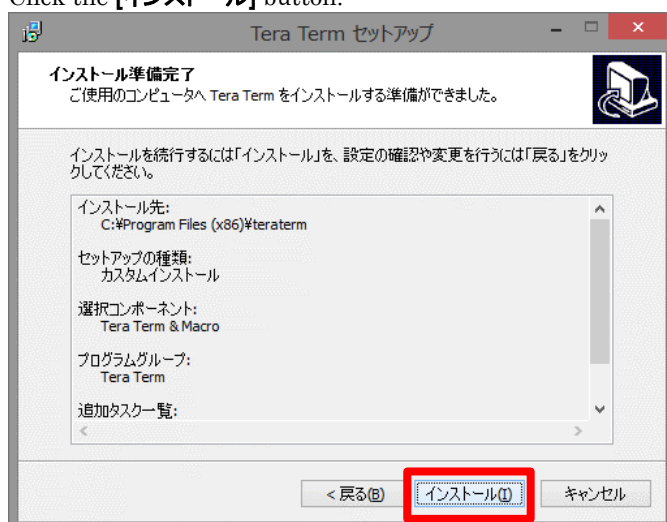
9. Click the **[次へ]** button.



10. Click the **[次へ]** button.



11. Click the **[インストール]** button.



12. Once setup is complete, click the **[完了]** button.



This completes the installation of the software on the Windows PC.

Chapter 3 Setting up CEV Linux SDK

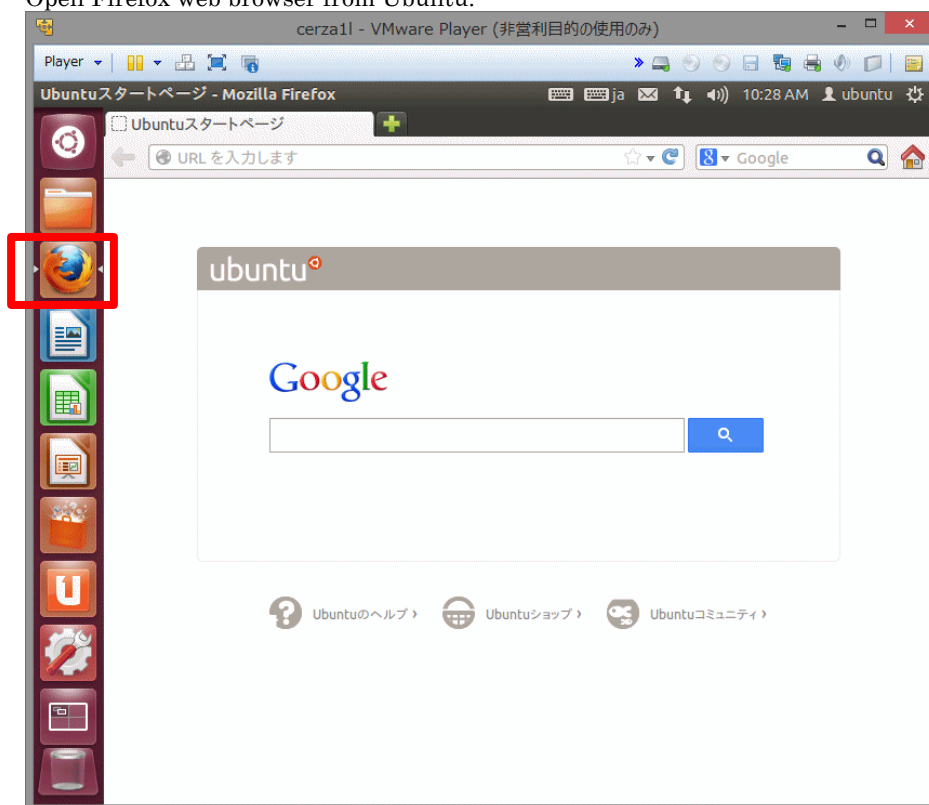
3.1 Introduction

This chapter describes setting up CEV Linux SDK.

3.2 Downloading CEV Linux SDK

The CEV Linux SDK is available for download from our homepage (Computex Co., Ltd.).
First, download the "CEV Linux SDK" and "CEV-RZ/A1L USB flash drive bootable rootfs".

1. Open Firefox web browser from Ubuntu.

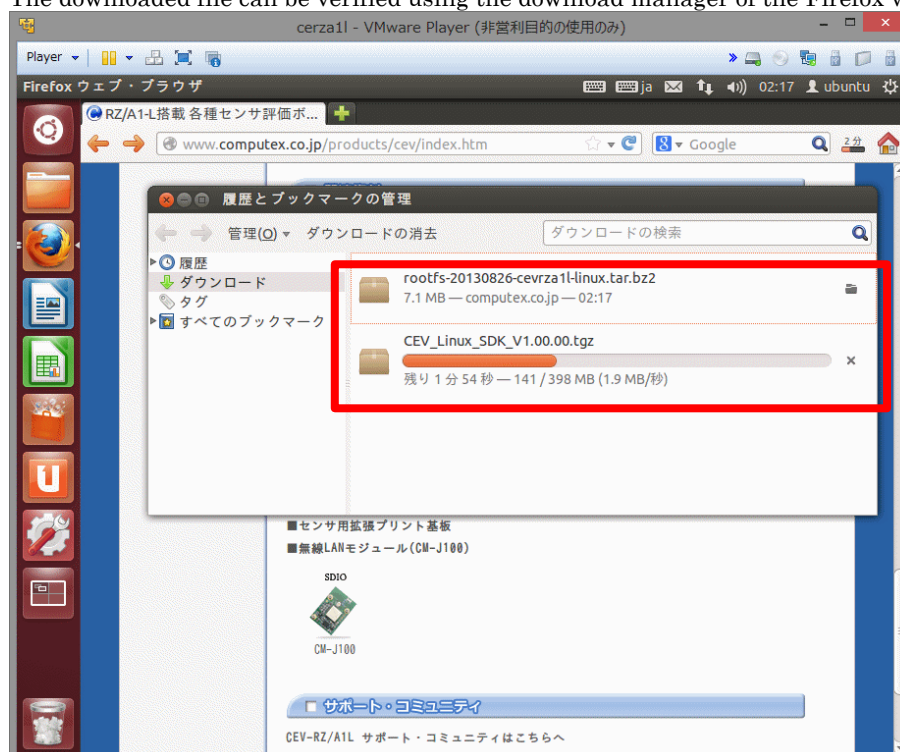


- Download the CEV Linux SDK in the related document by opening the following URL:
<http://www.computex.co.jp/eg/products/cev/>

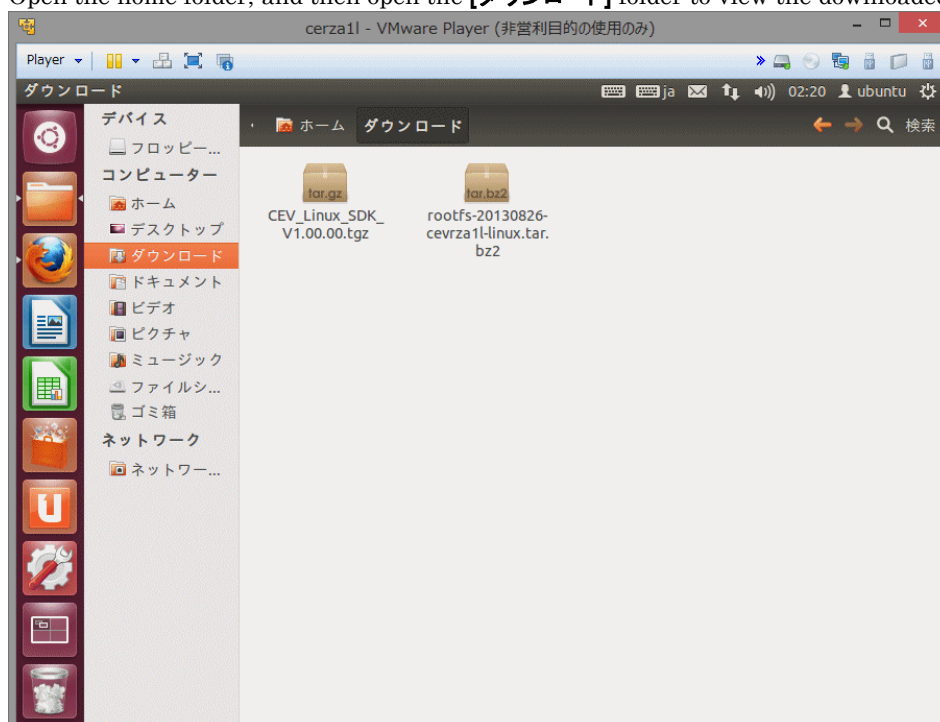
Download the latest CEV Linux SDK from the website.



- The downloaded file can be verified using the download manager of the Firefox web browser.



4. Open the home folder, and then open the **[ダウンロード]** folder to view the downloaded files.



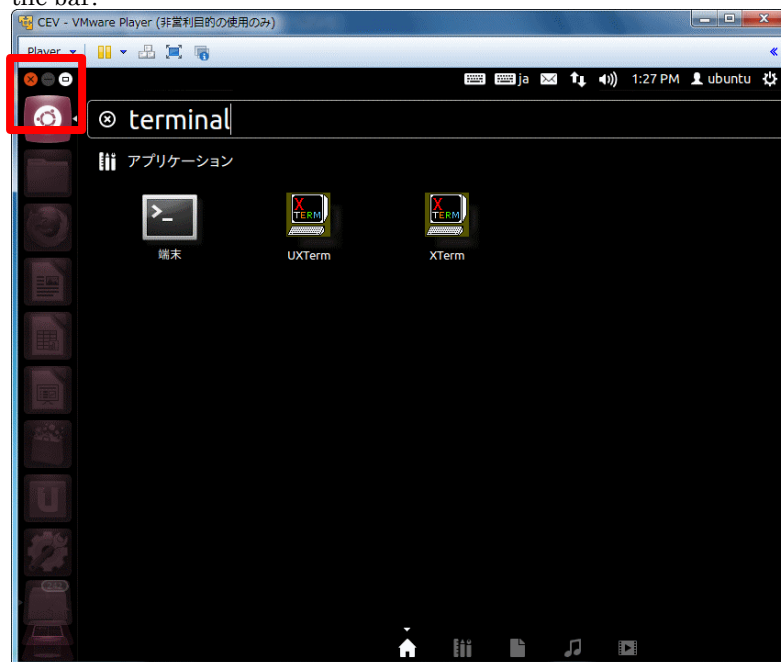
The "CEV Linux SDK" and "CEV-RZ/A1L USB flash drive bootable rootfs" have been downloaded.

3.3 Extracting the CEV Linux SDK

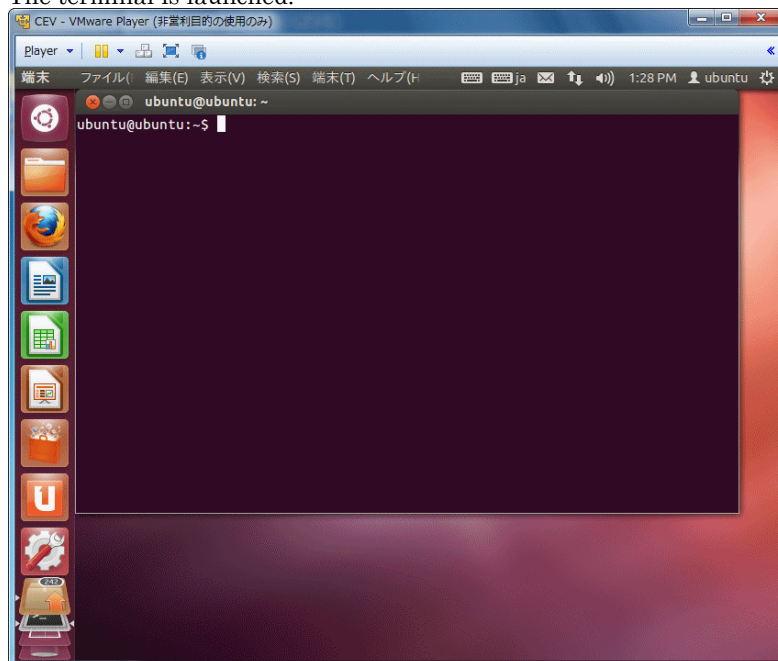
Since the downloaded CEV Linux SDK is compressed, it has to be extracted before use.

Extract the downloaded CEV_Linux_SDK_{version}.tgz file as described below:

1. Open the terminal.
Click the **[Dash ホーム]** icon at the top of the icon list located on the left side of the Ubuntu desktop.
The search bar appears. Enter **"terminal"** in the bar and then click the **[端末]** icon that appears below the bar.



2. The terminal is launched.



3. Extract the file using the following command:

```
ubuntu@ubuntu:~$ tar -zxvf CEV_Linux_SDK_{version}.tgz
```

4. The CEV Linux SDK file is extracted to the folder under the home directory.

```
ubuntu@ubuntu:~$ ls CEV_Linux_SDK_{version}
```

3.4 Creating a USB flash drive using the compiled binary file

The CEV-RZ/A1L board itself can only run U-Boot.

To run Linux, create a Linux file that will be placed in the SDRAM on a USB flash drive because the files needed to run Linux are loaded from a USB flash drive into SDRAM and then executed.

The "rootfs-cevrzall-linux-{date}.tar.gz" file downloaded from our homepage is a compiled file system. If you want to run Linux immediately without compiling the CEV Linux SDK, create a bootable USB flash drive as described below:

1. Connect a standard USB flash drive to a USB connector on your Windows PC.
2. Assign the USB flash drive connected to your Windows PC to the virtual PC on which Ubuntu is running under VMware Player.
3. The USB flash drive is auto-mounted after being identified by Ubuntu. If this does not occur, format the USB flash drive using Ubuntu.
4. Check the mount point and verify the device name of the USB flash drive.

In the example below, the USB flash drive with volume name "usb_memory" is mounted on /dev/sdb1.

```
ubuntu@ubuntu:~$ df -T
```

Filesystem	Type	1K-blocks	Used	Available	Use%	Mounted on
/dev/sda1	ext4	19609276	16957168	1656012	92%	/
udev	devtmpfs	505100	4	505096	1%	/dev
tmpfs	tmpfs	204960	820	204140	1%	/run
none	tmpfs	5120	0	5120	0%	/run/lock
none	tmpfs	512396	152	512244	1%	/run/shm
/dev/sdb1	vfat	1982064	21712	1859668	2%	/media/usb_memory

5. If the USB flash drive format is other than ext2, unmount and format it again, as follows.
It may be useful to specify a label with the -L option for future use.

```
ubuntu@ubuntu:~$ umount /dev/sdb1
ubuntu@ubuntu:~$ sudo mkfs.ext2 /dev/sdb1 -L usb_linux
[sudo] password for ubuntu: *****
mke2fs 1.42 (29-Nov-2011)
Filesystem label=usb_linux
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
Stride=0 blocks, Stripe width=0 blocks
125952 inodes, 503432 blocks
25171 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=515899392
16 block groups
32768 blocks per group, 32768 fragments per group
7872 inodes per group
Superblock backups stored on blocks:
    32768, 98304, 163840, 229376, 294912

Allocating group tables: done
Writing inode tables: done
Writing superblocks and filesystem accounting information: done

ubuntu@ubuntu:~$
```

6. The USB flash drive is usually not mounted after being unmounted and formatted. Once formatting is complete, disconnect and then reconnect the USB flash drive to initiate automatic mounting. In the example below, the USB flash drive device /dev/sdb1 is mounted on the /media/usb_linux folder.

```
ubuntu@ubuntu:~$ df
Filesystem      1K-blocks      Used Available Use% Mounted on
/dev/sda1        19609276 16957168  1656012  92% /
udev              505072         4    505068   1% /dev
tmpfs            204960         820    204140   2% /run
none              5120           0      5120   0% /run/lock
none             512396        152    512244   1% /run/shm
/dev/sdb1        1982064       21712   1859668   2% /media/usb_linux
```

7. The Linux bootable USB flash drive can now be written to from Ubuntu.
8. Extract the "rootfs-cevrza1l-linux-{date}.tar.gz" file and then copy it to the USB flash drive.

```
ubuntu@ubuntu:~$ tar zxvf rootfs-cevrza1l-linux-{date}.tar.gz
ubuntu@ubuntu:~$ sudo cp -rfp rootfs/* /media/usb_linux/
ubuntu@ubuntu:~$ sudo chown -R root:root /media/usb_linux/*
```

9. Unmount the USB flash drive.

```
ubuntu@ubuntu:~$ umount /media/usb_linux/
```

10. Remove the USB flash drive from your host PC, and then connect it to the USB host on the CEV-RZ/A1L board.
11. Connect the USB cable.
12. Launch Tera Term and then open the COM port of the USB serial converter.
13. The kernel (/boot/uImage) on the USB flash drive is loaded and Linux is booted.

Chapter 4 Building

4.1 Introduction

The Linux development environment provided by the CEV Linux SDK is enabled by software called Buildroot. The Buildroot software allows the user to easily build a cross-gcc compiler, U-Boot, and Linux kernel from the application and library sources using a series of make commands.

The CEV Linux SDK consists of Buildroot with add-on fix patches for the sources required for the CEV-RZ/A1L board and unique applications.

A compiled binary is included in the standard file system, so you can execute it immediately after copying it to the USB flash drive.

This chapter describes how to build U-Boot, Linux kernel, and application samples.

U-Boot is preloaded on the CEV-RZ/A1L board and can be reloaded. Note, however, that the board itself cannot restore U-Boot if it fails to be reloaded due to a power loss.

It can be restored using a JTAG-ICE, such as Computex PALMiCE3.

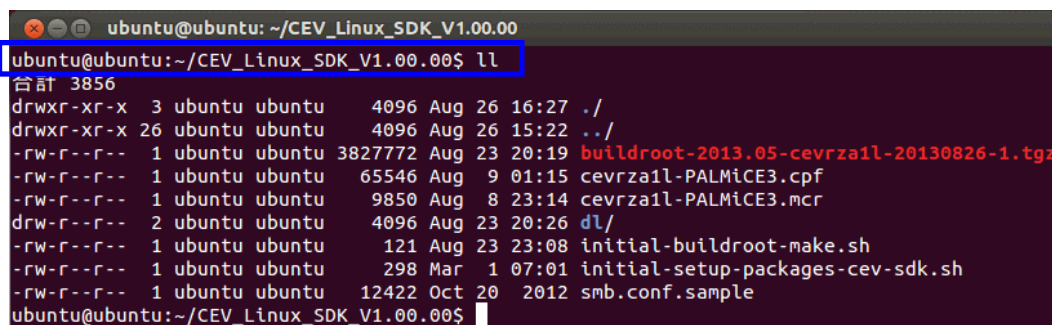
4.1.1 Executing the development environment setup script

The script file [initial-setup-packages-cev-sdk.sh] is provided for installing the package for making Buildroot and setting up a development environment such as samba. Execute this development environment setup script to set up a development environment.

Move to the CEV Linux SDK folder to verify its contents.

The commands are

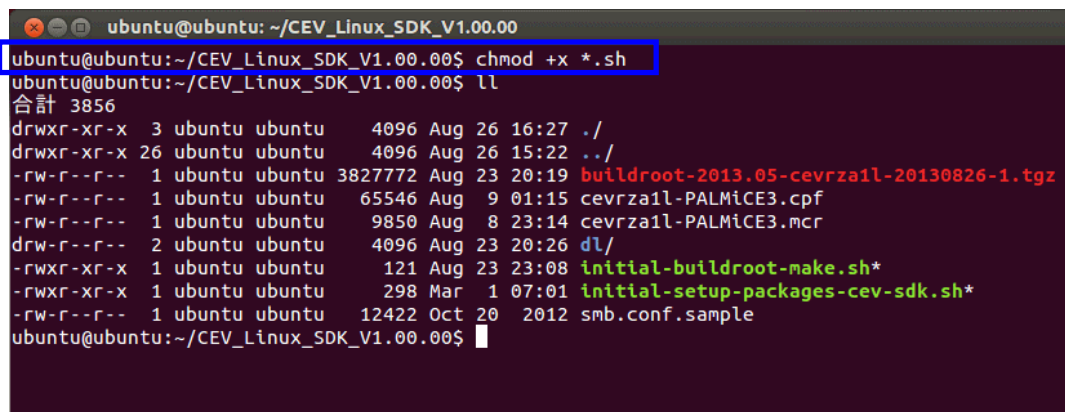
```
ubuntu@ubuntu:~$ cd CEV_Linux_SDK_{version}
ubuntu@ubuntu:~/CEV_Linux_SDK_{version}$ ll.
```



```
ubuntu@ubuntu: ~/CEV_Linux_SDK_V1.00.00
ubuntu@ubuntu:~/CEV_Linux_SDK_V1.00.00$ ll
合計 3856
drwxr-xr-x  3 ubuntu ubuntu    4096 Aug 26 16:27 ./
drwxr-xr-x 26 ubuntu ubuntu    4096 Aug 26 15:22 ../
-rw-r--r--  1 ubuntu ubuntu 3827772 Aug 23 20:19 buildroot-2013.05-cevrza1l-20130826-1.tgz
-rw-r--r--  1 ubuntu ubuntu   65546 Aug  9 01:15 cevrza1l-PALMiCE3.cpf
-rw-r--r--  1 ubuntu ubuntu   9850 Aug  8 23:14 cevrza1l-PALMiCE3.mcr
drw-r--r--  2 ubuntu ubuntu    4096 Aug 23 20:26 dl/
-rw-r--r--  1 ubuntu ubuntu    121 Aug 23 23:08 initial-buildroot-make.sh
-rw-r--r--  1 ubuntu ubuntu    298 Mar  1 07:01 initial-setup-packages-cev-sdk.sh
-rw-r--r--  1 ubuntu ubuntu 12422 Oct 20 2012 smb.conf.sample
ubuntu@ubuntu:~/CEV_Linux_SDK_V1.00.00$
```

If the shell script file (extension = .sh) has no execution attributes, use the following chmod command to set the execution attributes:

```
ubuntu@ubuntu:~/CEV_Linux_SDK_{version}$ chmod +x *.sh
```



```
ubuntu@ubuntu: ~/CEV_Linux_SDK_V1.00.00
ubuntu@ubuntu:~/CEV_Linux_SDK_V1.00.00$ chmod +x *.sh
ubuntu@ubuntu:~/CEV_Linux_SDK_V1.00.00$ ll
合計 3856
drwxr-xr-x  3 ubuntu ubuntu    4096 Aug 26 16:27 ./
drwxr-xr-x 26 ubuntu ubuntu    4096 Aug 26 15:22 ../
-rw-r--r--  1 ubuntu ubuntu  3827772 Aug 23 20:19 buildroot-2013.05-cevrza1l-20130826-1.tgz
-rw-r--r--  1 ubuntu ubuntu   65546 Aug  9 01:15 cevrza1l-PALMiCE3.cpf
-rw-r--r--  1 ubuntu ubuntu   9850 Aug  8 23:14 cevrza1l-PALMiCE3.mcr
drw-r--r--  2 ubuntu ubuntu    4096 Aug 23 20:26 dl/
-rwxr-xr-x  1 ubuntu ubuntu    121 Aug 23 23:08 initial-buildroot-make.sh*
-rwxr-xr-x  1 ubuntu ubuntu    298 Mar  1 07:01 initial-setup-packages-cev-sdk.sh*
-rw-r--r--  1 ubuntu ubuntu  12422 Oct 20 2012 smb.conf.sample
ubuntu@ubuntu:~/CEV_Linux_SDK_V1.00.00$
```

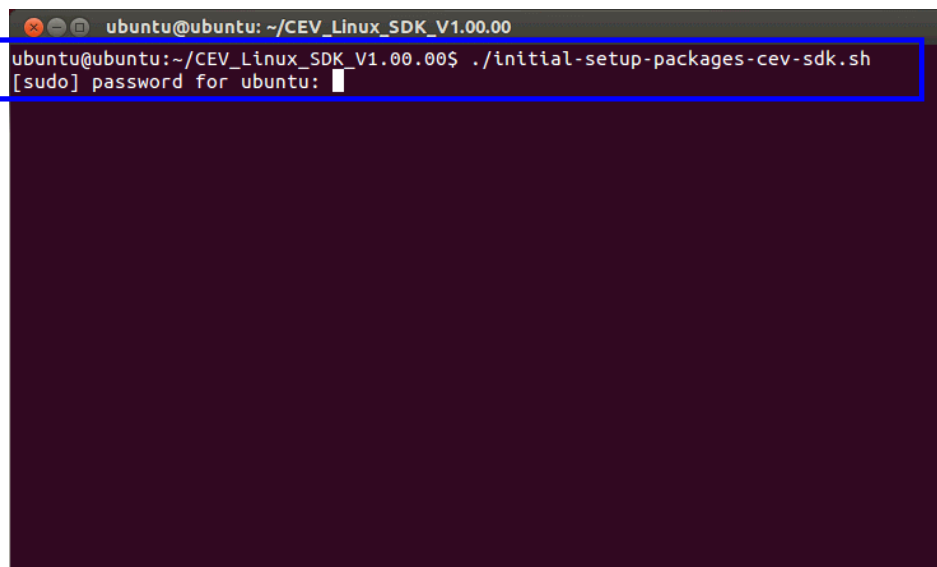
To start the setup, execute

```
ubuntu@ubuntu:~/CEV_Linux_SDK_{version}$ ./initial-setup-packages-ckb-sdk.sh
```

or

```
ubuntu@ubuntu:~/CEV_Linux_SDK_{version}$ sh initial-setup-packages-ckb-sdk.sh.
```

To execute sudo commands, enter your password when prompted.



```
ubuntu@ubuntu: ~/CEV_Linux_SDK_V1.00.00
ubuntu@ubuntu:~/CEV_Linux_SDK_V1.00.00$ ./initial-setup-packages-cev-sdk.sh
[sudo] password for ubuntu:
```


Enter "Y" to verify the package installation and allow the installation to continue.
The package installation takes a few to tens of minutes.

```
ubuntu@ubuntu: ~/CEV_Linux_SDK_V1.00.00
ヒット http://us.archive.ubuntu.com precise-backports/main Translation-en
ヒット http://us.archive.ubuntu.com precise-backports/multiverse Translation-en
ヒット http://us.archive.ubuntu.com precise-backports/restricted Translation-en
ヒット http://us.archive.ubuntu.com precise-backports/universe Translation-en
パッケージリストを読み込んでいます... 完了
パッケージリストを読み込んでいます... 完了
依存関係ツリーを作成しています
状態情報を読み取っています... 完了
注意、'ncurses-dev' の代わりに 'libncurses5-dev' を選択しています
git-core はすでに最新バージョンです。
libncurses5-dev はすでに最新バージョンです。
netpbm はすでに最新バージョンです。
texinfo はすでに最新バージョンです。
uboot-mkimage はすでに最新バージョンです。
samba はすでに最新バージョンです。
提案パッケージ:
  bison-doc build-essential g++-multilib gettext-doc subversion-tools db4.8-util
以下のパッケージが新たにインストールされます:
  bison flex g++ gettext subversion
アップグレード: 0 個、新規インストール: 5 個、削除: 0 個、保留: 295 個。
1,909 kB 中 0 B のアーカイブを取得する必要があります。
この操作後に追加で 6,929 kB のディスク容量が消費されます。
続行しますか [Y/n]?
```

Set up the password for SMB.

```
ubuntu@ubuntu: ~/CEV_Linux_SDK_V1.00.00
ヒット http://us.archive.ubuntu.com precise-backports/main Translation-en
ヒット http://us.archive.ubuntu.com precise-backports/multiverse Translation-en
ヒット http://us.archive.ubuntu.com precise-backports/restricted Translation-en
ヒット http://us.archive.ubuntu.com precise-backports/universe Translation-en
パッケージリストを読み込んでいます... 完了
パッケージリストを読み込んでいます... 完了
依存関係ツリーを作成しています
状態情報を読み取っています... 完了
注意、'ncurses-dev' の代わりに 'libncurses5-dev' を選択しています
bison はすでに最新バージョンです。
flex はすでに最新バージョンです。
g++ はすでに最新バージョンです。
gettext はすでに最新バージョンです。
git-core はすでに最新バージョンです。
libncurses5-dev はすでに最新バージョンです。
netpbm はすでに最新バージョンです。
texinfo はすでに最新バージョンです。
uboot-mkimage はすでに最新バージョンです。
samba はすでに最新バージョンです。
subversion はすでに最新バージョンです。
アップグレード: 0 個、新規インストール: 0 個、削除: 0 個、保留: 295 個。
sudo smbpasswd -a ubuntu
New SMB password:
```

Enter the same password for verification.

```
ubuntu@ubuntu: ~/CEV_Linux_SDK_V1.00.00
ヒット http://us.archive.ubuntu.com precise-backports/multiverse Translation-en
ヒット http://us.archive.ubuntu.com precise-backports/restricted Translation-en
ヒット http://us.archive.ubuntu.com precise-backports/universe Translation-en
パッケージリストを読み込んでいます... 完了
パッケージリストを読み込んでいます... 完了
依存関係ツリーを作成しています
状態情報を読み取っています... 完了
注意、'ncurses-dev' の代わりに 'libncurses5-dev' を選択しています
bison はすでに最新バージョンです。
flex はすでに最新バージョンです。
g++ はすでに最新バージョンです。
gettext はすでに最新バージョンです。
git-core はすでに最新バージョンです。
libncurses5-dev はすでに最新バージョンです。
netpbm はすでに最新バージョンです。
texinfo はすでに最新バージョンです。
uboot-mkimage はすでに最新バージョンです。
samba はすでに最新バージョンです。
subversion はすでに最新バージョンです。
アップグレード: 0 個、新規インストール: 0 個、削除: 0 個、保留: 295 個。
sudo smbpasswd -a ubuntu
New SMB password:
Retype new SMB password:
```

When the script ends, setup is complete.

You can now access the Linux host folder as a shared folder from your Windows host PC.

Verify the Ubuntu IP address from the Ubuntu terminal.

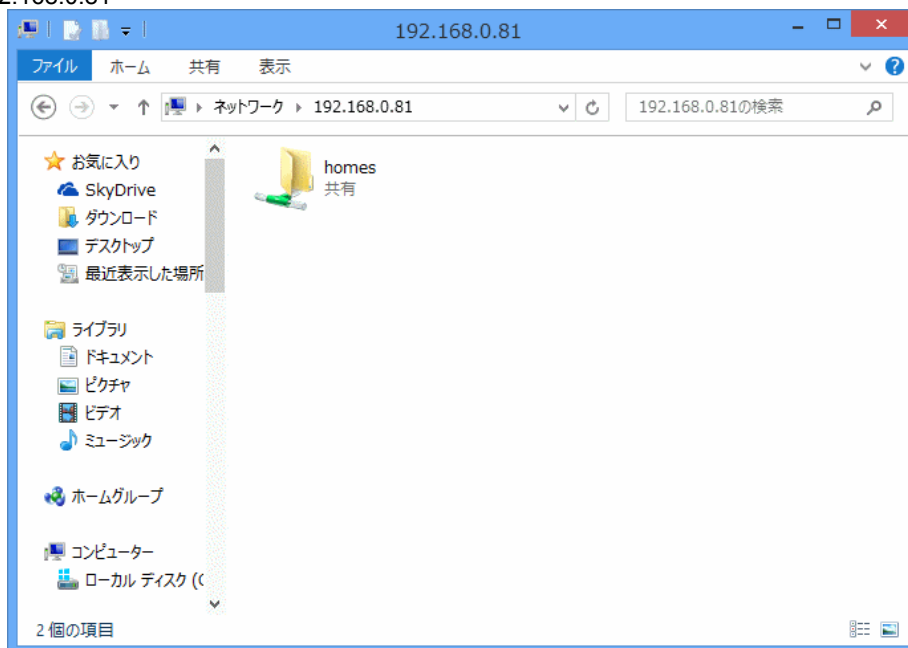
```
ubuntu@ubuntu: ~/CEV_Linux_SDK_V1.00.00
ubuntu@ubuntu:~/CEV_Linux_SDK_V1.00.00$ ifconfig
eth0      Link encap:イーサネット ハードウェアアドレス 00:0c:29:4c:4d:54
          inetアドレス:192.168.0.81   ブロードキャスト:192.168.0.255   マスク:255.25
          5.255.0
          inet6アドレス: fe80::20c:29ff:fe4c:4d54/64 範囲:リンク
          UP BROADCAST RUNNING MULTICAST  MTU:1500  メトリック:1
          RXパケット:730898 エラー:0 損失:2580 オーバラン:0 フレーム:0
          TXパケット:145034 エラー:0 損失:0 オーバラン:0 キャリア:0
          衝突(Collisions):0 TXキュー長:1000
          RXバイト:878064291 (878.0 MB) TXバイト:26091884 (26.0 MB)
          割り込み:19 ベースアドレス:0x2024

lo        Link encap:ローカルループバック
          inetアドレス:127.0.0.1   マスク:255.0.0.0
          inet6アドレス: ::1/128 範囲:ホスト
          UP LOOPBACK RUNNING  MTU:16436  メトリック:1
          RXパケット:4 エラー:0 損失:0 オーバラン:0 フレーム:0
          TXパケット:4 エラー:0 損失:0 オーバラン:0 キャリア:0
          衝突(Collisions):0 TXキュー長:0
          RXバイト:240 (240.0 B) TXバイト:240 (240.0 B)

ubuntu@ubuntu:~/CEV_Linux_SDK_V1.00.00$
```

In this case, the IP address is set to 192.168.0.81.

Enter the IP address directly with "\\\" in the "Explorer" address bar of your Windows host PC.
"\\192.168.0.81"



You will be prompted to enter the password if your Windows user name and password are different.
In this case, enter ubuntu for the Linux host user name and password.
This displays the home folder for the Linux host user name (ubuntu).

4.1.2 Description of development environment setup script

This chapter describes the processing performed by the development environment setup script.

```
#!/bin/sh
```

Declare the use of shell script.

```
sudo apt-get update
```

Retrieve the latest package list.

```
sudo apt-get install ncurses-dev uboot-mkimage bison flex gettext texinfo g++ subversion git-core netpbm samba
```

Install the specified package.

```
sudo cp smb.conf.sample /etc/samba/smb.conf
```

Copy the configuration file for samba.

```
sudo smbpasswd -a username
```

Set up the password for samba.

```
sudo /etc/init.d/smbd restart
```

Restart samba.

Note

The password is required to execute sudo commands. If you use sudo commands sequentially, however, you do not need to re-enter the password within a certain period.

4.1.3 Executing initial build script

The script file [initial-buildroot-make.sh] is provided to extract and execute make Buildroot. Execute this initial build script to build U-Boot, Linux kernel, and applications.

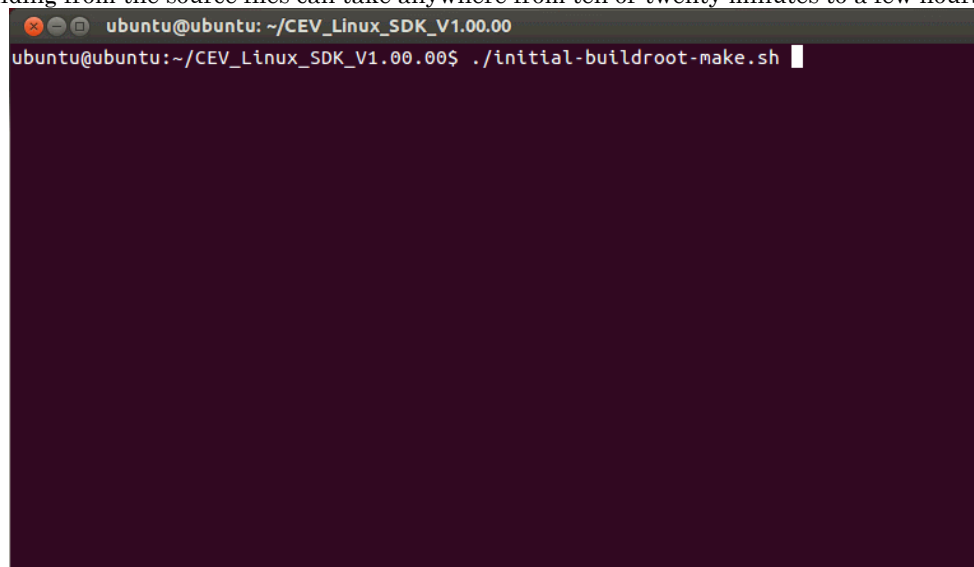
Start the initial build script by executing the following command:

```
ubuntu@ubuntu:~/CEV_Linux_SDK_{version}$ ./initial-buildroot-make.sh
```

or

```
ubuntu@ubuntu:~/CEV_Linux_SDK_{version}$ sh initial-buildroot-make.sh
```

Building from the source files can take anywhere from ten or twenty minutes to a few hours.



Once the build has been successfully completed, image files are created under the [buildroot-{version}/output/images] directory in the CEV Linux SDK directory. The root file system is created under the [buildroot-{version}/output/target] directory. For an explanation of how to load these files, see "**Chapter 5 How to create a USB flash drive**".

4.1.4 Description of initial build script

This chapter describes the processing performed by the initial build script.

```
#!/bin/sh
```

Declare the use of a shell script.

```
tar xzf buildroot-{version}.tgz
```

Open the source file.

```
cd buildroot-{version}
```

Move to the current directory.

```
ln -s ../dl dl
```

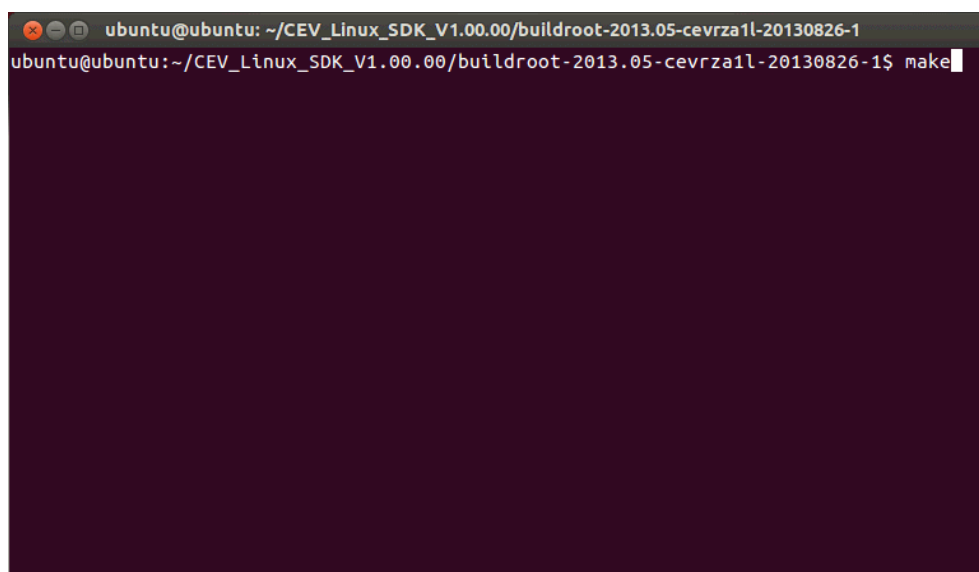
Set up the link.

```
make
```

Perform the build.

4.1.5 Rebuilding

If you need to perform rebuilding after changing the source, use the make commands in the Buildroot directory.



The following arguments are frequently used with the make commands:

```
ubuntu@ubuntu:~/CEV_Linux_SDK_{version}/buildroot-{version}$ make clean
```

Deletes all created objects and images.

```
ubuntu@ubuntu:~/CEV_Linux_SDK_{version}/buildroot-{version}$ make all
```

Performs all building.

For an explanation of how to use other make commands, refer to the Buildroot manual.

Chapter 5 How to create a USB flash drive

5.1 Introduction

This chapter describes how to load the embedded Linux running on the CEV-RZ/A1L board to a USB flash drive.

The CEV-RZ/A1L board has 2 MB of serial flash memory, and the U-Boot program is loaded into this memory. Mount the file system containing the Linux kernel and applications on a USB flash drive for execution.

“3.4 Creating a USB flash drive using the compiled binary file” describes how to create a boot USB flash drive from the compiled file system. However, this chapter describes how to create a USB flash drive from the root file system compiled by the CEV Linux SDK.

5.2 How to create a bootable USB flash drive

This describes how to create a USB flash drive using Ubuntu running on VMware Player.

Most standard USB flash drives are pre-formatted using the FAT file system, but an ext2-formatted USB flash drive is used with the CEV-RZ/A1L. Therefore, you first need to change the USB flash drive format to ext2 by using Ubuntu, and then copy the required Linux kernel and applications to the drive.

5.2.1 Changing the USB flash drive format to ext2

Format the USB flash drive to be used with the CEV-RZ/A1L, using the ext2 file system, as described below:

1. Connect a standard USB flash drive to the USB connector on your Windows PC.
2. Assign the USB flash drive connected to your Windows PC to the virtual PC of Ubuntu running on VMware Player.
3. The USB flash drive is auto-mounted after being identified by Ubuntu. If not, format the USB flash drive using Ubuntu.
4. Check the mount point and verify the USB flash drive device name.

In the example below, the USB flash drive with the volume name "usb_memory" is mounted on /dev/sdb1.

```
ubuntu@ubuntu:~$ df
Filesystem      1K-blocks    Used Available Use% Mounted on
/dev/sda1      19609276 16957168  1656012  92% /
udev              505072         4    505068    1% /dev
tmpfs           204956      2328    202628    2% /run
none              5120         0       5120    0% /run/lock
none            512380      152    512228    1% /run/shm
/dev/sdb1      1982064    21712   1859668    2% /media/usb_memory
```


5. If the USB flash drive format is other than ext2, format it again, as follows:
Unmount and then format it using the ext2 file system. It may be useful to specify the label with -L option for future use.

```
ubuntu@ubuntu:~$ umount /dev/sdb1
ubuntu@ubuntu:~$ sudo mkfs.ext2 /dev/sdb1 -L usb_linux
[sudo] password for ubuntu: *****
mke2fs 1.42 (29-Nov-2011)
Filesystem label=usb_linux
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
Stride=0 blocks, Stripe width=0 blocks
125952 inodes, 503432 blocks
25171 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=515899392
16 block groups
32768 blocks per group, 32768 fragments per group
7872 inodes per group
Superblock backups stored on blocks:
    32768, 98304, 163840, 229376, 294912

Allocating group tables: done
Writing inode tables: done
Writing superblocks and filesystem accounting information: done

ubuntu@ubuntu:~$
```

6. The USB flash drive is usually not mounted when unmounted and formatted. Once formatting is complete, disconnect and connect the USB flash drive to be automatically mounted.
In the example below, the USB flash drive device /dev/sdb1 is mounted in the /media/usb_linux folder.

```
ubuntu@ubuntu:~$ df
```

Filesystem	1K-blocks	Used	Available	Use%	Mounted on
/dev/sda1	19609276	16957168	1656012	92%	/
udev	505072	4	505068	1%	/dev
tmpfs	204956	2328	202628	2%	/run
none	5120	0	5120	0%	/run/lock
none	512380	152	512228	1%	/run/shm
/dev/sdb1	1982064	21712	1859668	2%	/media/usb_linux

7. The USB flash drive can now be loaded from Ubuntu.

5.2.2 Copying the root file system

Copy the root file system built with Buildroot to the USB flash drive.
Copy the file by using the following command:

```
ubuntu@ubuntu:~/CEV_Linux_SDK/buildroot-{version}$ sudo cp -rfp output/target/* /media/usb_linux/
```

5.2.3 Changing file ownership

Change the ownerships of all the files copied to the USB flash drive to root.

```
ubuntu@ubuntu:~/CEV_Linux_SDK/buildroot-{version}$ sudo chown -R root:root /media/usb_linux/*
```

5.2.4 Unmounting the USB flash drive

Unmount the USB flash drive.

```
ubuntu@ubuntu:~/CEV_Linux_SDK/buildroot-{version}$ sudo umount /media/usb_linux
```

Remove the unmounted USB flash drive from your PC, and then insert it into the USB host on the CEV-RZ/A1L board.

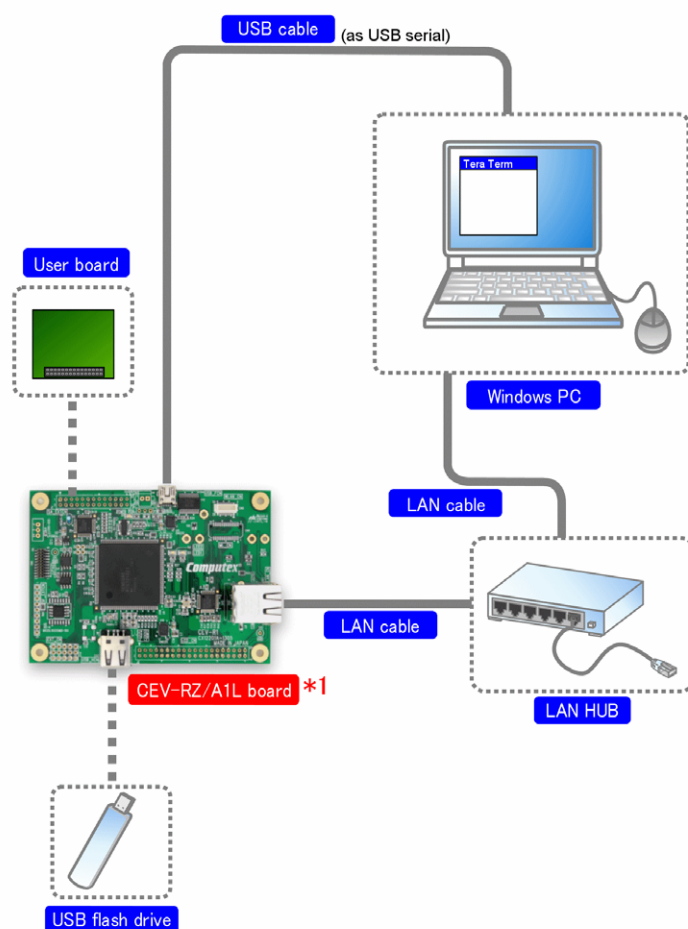
Chapter 6 Connecting the hardware

6.1 Introduction

This chapter describes how to connect the hardware used for the CEV Linux SDK.

6.2 Hardware connection diagram

To develop an embedded Linux environment, connect the hardware as follows:



Red text: Computex products
***1:** CEV-RZ/A1L board

Blue text: Prepare the equipment except the CEV-RZ/A1L board.

Chapter 7 Running CEV-RZ/A1L Linux

7.1 Introduction

This chapter describes how to run Linux on the CEV-RZ/A1L board.

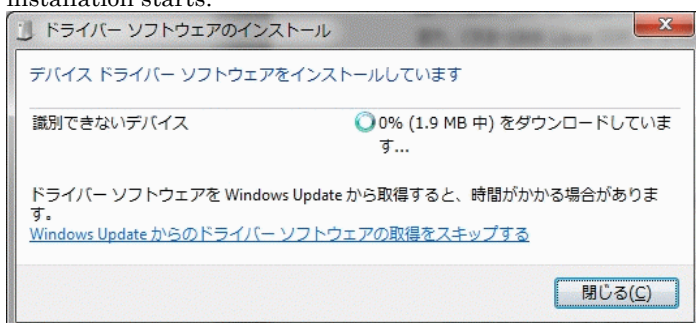
7.2 Powering on the CEV-RZ/A1L

The CEV-RZ/A1L has one USB function connector.

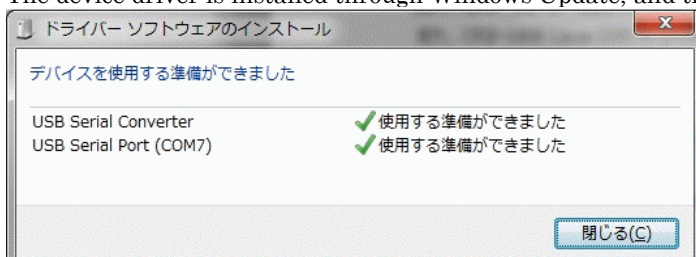
This USB function connector powers the board and functions as a USB serial converter.

Connect your PC to the board with a USB cable to power on. The USB function on the CEV-RZ/A1L is connected to the CPU UART through the USB serial converter.

1. The device driver for the USB serial converter is automatically downloaded and installed from the Internet through Windows Update. Your Windows PC must be connected to the Internet.
2. When you first connect your Windows PC to the CEV-RZ/A1L board with a USB cable, the driver software installation starts.



3. The device driver is installed through Windows Update, and this enables the use of USB serial port.



Make a note of the COM number for **[USB Serial Port]**.

This chapter assumes the use of **[COM7]**, as shown in the above picture.

7.3 Running the terminal software

Run the terminal software to communicate with the CEV-RZ/A1L. In this case, use the open source Tera Term.

Tera Term is available for download at the following URL:

<http://sourceforge.jp/projects/ttssh2/>

Once installed, run the program.

As the board is powered through the USB bus, the CEV-RZ/A1L is powered on and U-Boot starts as soon as the board is connected to the Windows PC through a USB cable.

Run the terminal software to set up the serial port.

Item	Setup value
Port	COM7 (COM number for USB serial port installed through Windows Update)
Baud rate	115200 bps
Data	8 bit
Parity	none
Stop	1 bit
Flow control	none

U-Boot is already booted when connected with the USB cable. Press the Enter key from the terminal software to verify if the U-Boot prompt ("=>") is displayed.

The version command displays the U-Boot version information.

Note

The USB function connector on the CEV-RZ/A1L board powers and operates as a USB serial converter. If you disconnect and connect the USB function connector, you also have to disconnect and reconnect the terminal software.

7.4 Booting Linux from U-Boot

Boot Linux using the U-Boot commands. Connect the USB flash drive to which the Linux kernel and file system have been copied to the USB host on the CEV-RZ/A1L board, and then boot Linux.

By default, the CEV-RZ/A1L board operates on the same USB power as the USB serial converter.

When connected to the host PC through the USB cable, the board is powered on and the USB serial converter driver is also identified by the host. Therefore, after inserting the USB cable, make a connection to the COM port on the terminal.

U-Boot should be running. Press the Enter key on the terminal a few times to display the prompt.

```
==>
==>
==>
```

Boot Linux by entering the following command:

U-Boot should be running. Press the Enter key on the terminal a few times to display the prompt.

```
=>
=> run usbboot
(Re)start USB...
USB0: scanning bus 0 for devices... 2 USB Device(s) found
      scanning usb for storage devices... 1 Storage Device(s) found
2546200 bytes read in 2250 ms (1.1 MiB/s)
## Booting kernel from Legacy Image at 0c000000 ...
   Image Name:   Linux-3.8.13
   Image Type:   ARM Linux Kernel Image (uncompressed)
   Data Size:    2546136 Bytes = 2.4 MiB
   Load Address: 0c008000
   Entry Point:  0c008000
   Verifying Checksum ... OK
   Loading Kernel Image ... OK
OK

Starting kernel ...

Booting Linux on physical CPU 0x0
Linux version 3.8.13 (ubuntu@ubuntu) (gcc version 4.7.3 (Buildroot 2013.08.1) ) #1 PREEMPT Thu Oct 31 17:24:48 JST 2013
CPU: ARMv7 Processor [413fc090] revision 0 (ARMv7), cr=18c53c7d
CPU: PIPT / VIPT nonaliasing data cache, VIPT aliasing instruction cache
Machine: cevrza1l
Memory policy: ECC disabled, Data cache writeback
Built 1 zonelists in Zone order, mobility grouping on. Total pages: 8128
Kernel command line: console=ttySC3,115200 root=/dev/sda1 rw rootdelay=3
PID hash table entries: 128 (order: -3, 512 bytes)
Dentry cache hash table entries: 4096 (order: 2, 16384 bytes)
Inode-cache hash table entries: 2048 (order: 1, 8192 bytes)
__ex_table already sorted, skipping sort
Memory: 32MB = 32MB total
Memory: 27216k/27216k available, 5552k reserved, 0K highmem
Virtual kernel memory layout:
   vector : 0xffff0000 - 0xffff1000 ( 4 kB)
   fixmap : 0xffff0000 - 0xfffe0000 ( 896 kB)
   vmalloc : 0xc2800000 - 0xff000000 ( 968 MB)
   lowmem  : 0xc0000000 - 0xc2000000 ( 32 MB)
   pkmap   : 0xbfe00000 - 0xc0000000 ( 2 MB)
   modules : 0xbf000000 - 0xbfe00000 ( 14 MB)
   .text : 0xc0008000 - 0xc04847ac (4594 kB)
   .init : 0xc0485000 - 0xc04a3ac8 ( 123 kB)
   .data : 0xc04a4000 - 0xc04d0300 ( 177 kB)
   .bss : 0xc04d0300 - 0xc0518460 ( 289 kB)
NR_IRQS:16 nr_irqs:16 16
sched_clock: 32 bits at 128 Hz, resolution 7812500ns, wraps every 3489660920ms
Console: colour dummy device 80x30
sh_mtu2.0: used for clock events
sh_mtu2.0: used for periodic clock events
Calibrating delay loop... 382.81 BogoMIPS (lpj=1492992)
pid_max: default: 32768 minimum: 301
Mount-cache hash table entries: 512
CPU: Testing write buffer coherency: ok
Setting up static identity map for 0xc3715a8 - 0xc371600
devtmpfs: initialized
pinctrl core: initialized pinctrl subsystem
NET: Registered protocol family 16
```

```

DMA: preallocated 256 KiB pool for atomic coherent allocations
L310 cache controller enabled
l2x0: 8 ways, CACHE_ID 0x000000c0, AUX_CTRL 0x42420000, Cache size: 131072 B
hw-breakpoint: Debug register access (0xee113e95) caused undefined instruction on CPU 0
hw-breakpoint: Debug register access (0xee112e91) caused undefined instruction on CPU 0
hw-breakpoint: CPU 0 debug is powered down!
bio: create slab <bio-0> at 0
SCSI subsystem initialized
usbcore: registered new interface driver usbfs
usbcore: registered new interface driver hub
usbcore: registered new device driver usb
cfg80211: Calling CRDA for country: JP
NET: Registered protocol family 2
TCP established hash table entries: 512 (order: 0, 4096 bytes)
TCP bind hash table entries: 512 (order: -1, 2048 bytes)
TCP: Hash tables configured (established 512 bind 512)
TCP: reno registered
UDP hash table entries: 256 (order: 0, 4096 bytes)
UDP-Lite hash table entries: 256 (order: 0, 4096 bytes)
NET: Registered protocol family 1
RPC: Registered named UNIX socket transport module.
RPC: Registered udp transport module.
RPC: Registered tcp transport module.
RPC: Registered tcp NFSv4.1 backchannel transport module.
ctexdbg enabled by computex.patch vers=014 online cpu=1
NFS: Registering the id_resolver key type
Key type id_resolver registered
Key type id_legacy registered
msgmni has been set to 53
Block layer SCSI generic (bsg) driver version 0.4 loaded (major 252)
io scheduler noop registered
io scheduler deadline registered
io scheduler cfq registered (default)
SuperH SCI(F) driver initialized
sh-sci.0: ttySC0 at MMIO 0xe8007000 (irq = 223) is a scif
sh-sci.1: ttySC1 at MMIO 0xe8007800 (irq = 227) is a scif
sh-sci.2: ttySC2 at MMIO 0xe8008000 (irq = 231) is a scif
sh-sci.3: ttySC3 at MMIO 0xe8008800 (irq = 235) is a scif
console [ttySC3] enabled
sh-sci.4: ttySC4 at MMIO 0xe8009000 (irq = 239) is a scif
rspi rspi.0: master is unqueued, this is deprecated
rspi rspi.0: probed
rspi rspi.1: master is unqueued, this is deprecated
rspi rspi.1: probed
rspi rspi.2: master is unqueued, this is deprecated
rspi rspi.2: probed
m25p80 spi3.0: mx25l1633e (2048 Kbytes)
Creating 3 MTD partitions on "m25p80":
0x000000000000-0x000000070000 : "U-Boot"
0x000000070000-0x000000080000 : "U-Boot environment"
0x000000080000-0x000000200000 : "User"
spibsc spibsc.0: probed
r8a66597_hcd r8a66597_hcd.0: USB Host Controller
r8a66597_hcd r8a66597_hcd.0: new USB bus registered, assigned bus number 1
r8a66597_hcd r8a66597_hcd.0: irq 73, io base 0xe8010000
hub 1-0:1.0: USB hub found
hub 1-0:1.0: 1 port detected
Initializing USB Mass Storage driver...
usbcore: registered new interface driver usb-storage

```



```

USB Mass Storage support registered.
mousedev: PS/2 mouse device common for all mice
sh-rtc sh-rtc: rtc core: registered sh as rtc0
i2c /dev entries driver
at24 0-0051: 128 byte 24c01 EEPROM, writable, 16 bytes/write
Read MAC addr from EEPROM: 00:a0:0b:12:34:56
i2c-riic i2c-riic.0: version 2013-04-19
i2c-riic i2c-riic.1: version 2013-04-19
i2c-riic i2c-riic.2: version 2013-04-19
i2c-riic i2c-riic.3: version 2013-04-19
sh_mobile_sdhi sh_mobile_sdhi.1: mmc0 base at 0xe804e800 clock rate 64 MHz
usb 1-1: new high-speed USB device number 2 using r8a66597_hcd
leds-gpio leds-gpio: pins are not configured from the driver
ledtrig-cpu: registered to indicate activity on CPUs
sh_pfc gpio: Cant find gpio chip
sh_mtu2 sh_mtu2.0: kept as earlytimer
mmc0: card claims to support voltages below the defined range. These will be ignored.
usbcore: registered new interface driver usbhid
usbhid: USB HID core driver
sh_adc sh_adc.0: version 2013-06-12
nf_conntrack version 0.5.0 (425 buckets, 1700 max)
IPv4 over IPv4 tunneling driver
ip_tables: (C) 2000-2006 Netfilter Core Team
TCP: cubic registered
NET: Registered protocol family 10
sit: IPv6 over IPv4 tunneling driver
NET: Registered protocol family 17
NET: Registered protocol family 15
Key type dns_resolver registered
VFP support v0.3: implementor 41 architecture 3 part 30 variant 9 rev 4
mmc0: queuing unknown CIS tuple 0x91 (3 bytes)
mmc0: new SDIO card at address 0001
libphy: sh_mii: probed
Base address at 0xe8203000, 00:a0:0b:12:34:56, IRQ 359.
sh-rtc sh-rtc: setting system clock to 1970-01-01 00:00:01 UTC (1)
Waiting 3sec before mounting root device...
scsi0 : usb-storage 1-1:1.0
scsi 0:0:0:0: Direct-Access   Generic Flash Disk    8.07 PQ: 0 ANSI: 2
sd 0:0:0:0: [sda] 4028416 512-byte logical blocks: (2.06 GB/1.92 GiB)
sd 0:0:0:0: [sda] Write Protect is off
sd 0:0:0:0: [sda] No Caching mode page present
sd 0:0:0:0: [sda] Assuming drive cache: write through
sd 0:0:0:0: [sda] No Caching mode page present
sd 0:0:0:0: [sda] Assuming drive cache: write through
sda: sda1
sd 0:0:0:0: [sda] No Caching mode page present
sd 0:0:0:0: [sda] Assuming drive cache: write through
sd 0:0:0:0: [sda] Attached SCSI removable disk
EXT2-fs (sda1): warning: mounting unchecked fs, running e2fsck is recommended
VFS: Mounted root (ext2 filesystem) on device 8:1.
devtmpfs: mounted
Freeing init memory: 120K
Starting logging: OK
Initializing random number generator... done.
insmod CM-J100...
modprobe ...
nfs4filelayout_init: NFSv4 File Layout Driver Registering...
Waiting for wlan0 interface to be ready...
Please be patient....

```

```

cm-j100: loaded
Starting create_connect_sh...
"/etc/network/wlan-scripts/connect.sh" already exists.
Starting network...
Waiting for wlan0 interface to be ready...
Starting wpa_supplicant...
Successfully initialized wpa_supplicant
cm-j100: firmware booted (Rev 6.3.10.2.115)
IPv6: ADDRCONF(NETDEV_UP): wlan0: link is not ready
cm-j100: down
cm-j100: firmware booted (Rev 6.3.10.2.115)
IPv6: ADDRCONF(NETDEV_UP): wlan0: link is not ready
killall: hostapd: no process killed
Configuration file: /etc/hostapd.conf
cm-j100: down
cm-j100: firmware booted (Rev 6.3.10.2.115)
IPv6: ADDRCONF(NETDEV_UP): wlan0: link is not ready
Using interface wlan0 with hwaddr 00:a0:0b:23:00:0d and ssid "CEV00a00b23000d"
IPv6: ADDRCONF(NETDEV_CHANGE): wlan0: link becomes ready
ifup: interface wlan0 already configured
net eth0: attached phy 0 to driver Generic PHY
udhcpc (v1.21.1) started
grep: /etc/resolv.conf: No such file or directory
Failed to kill daemon: No such file or directory
Sending discover...
libphy: sh-eth-0:00 - Link is Up - 100/Full
Sending discover...
Sending select for 192.168.0.195...
Lease of 192.168.0.195 obtained, lease time 86400
Failed to kill daemon: No such file or directory
deleting routers
route: SIOCDELRT: No such process
adding dns 192.168.0.1
Starting httpd...
Initialize SmartAnalog...
SmartAnalog Initialized.
Enable iio Hardware trigger...
sensor scan start.
Starting sensor daemon...

Welcome to cevza1l
cevza1l login:

```

7.5 Logging in

When Linux is booted, the login prompt is displayed on the console. The default user name is "root" and there is no password.

Log in as follows:

```

Welcome to CEV-RZ/A1L
cevza1l login: root
#

```

7.6 Network settings

By default, the Linux SDK for CEV-RZ/A1L is set up to allow the user to use Ethernet (eth0) immediately.

7.6.1 Network default settings

Linux for the CEV-RZ/A1L has the following default interface settings:

Ethernet (eth0) is set to automatically obtain an IP address from the DHCP server. Connect to the network incorporating the DHCP server because an IP address is obtained from the DHCP server on the same network.

Interface	Ethernet (eth0)
IP address settings	Obtained from DHCP server
IP address	
Netmask	
Network	
Broadcast	
Gateway	

7.6.2 Changing the IP address

The IP address can be changed by rewriting the `/etc/network/interfaces` file.
`/etc/network/interfaces`

Default settings (eth0=DHCP)	Description
<code>auto lo eth0 wlan0</code>	Automatically sets up lo, eth0, and wlan0.
<code>iface lo inet loopback</code>	Sets up the lo device in loopback mode.
<code>iface eth0 inet dhcp</code>	Sets up eth0 to be obtained from the DHCP server.
<code>iface wlan0 inet static</code>	Sets up wlan0 for the static IP. The following are the static IP addresses.
<code>address 192.168.100.1</code>	wlan0 IP address (192.168.100.1)
<code>netmask 255.255.255.0</code>	wlan0 netmask (255.255.255.0)
<code>network 192.168.100.0</code>	wlan0 network (192.168.100.0)
<code>broadcast 192.168.100.255</code>	wlan0 broadcast (192.168.100.255)
<code>gateway 192.168.100.1</code>	wlan0 gateway (192.168.100.1)

The syntax of the `iface` line is as follows:

```
iface {device} inet { dhcp | static }
```

For static IP, type the static IP address on the next line.

7.6.3 Verifying the network settings

To verify the network connections, use the following commands:

Verifying Ethernet (eth0)

```
CEV # ifconfig eth0
eth0  Link encap:Ethernet Hwaddr 00:A0:0B:21:00:01
      inet addr:192.168.0.140 Bcast:192.168.0.255 Mask:255.255.255.0
      inet6 addr: fe80::2a0:bff:fe00:1/64 Scope:Link
      UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
      RX packets:1442 errors:0 dropped:115 overruns:0 frame:0
      TX packets:203 errors:0 dropped:0 overruns:0 carrier:0
      collisions:0 txqueuelen:1000
      RX bytes:129565 (126.5 KiB) TX bytes:111417 (108.8 KiB)
      Interrupt:33
```

Hwaddr : This is a MAC address. By default, it stores the vendor code for Computex.

inet addr : The user can access from any devices on the same network using the IP address configured here.

Chapter 8 CEV-RZ/A1L Web Applications

8.1 Introduction

The Linux file system for this board has built-in Web applications for controlling the httpd server and the board. Connecting this board to the access point or hub in your home with Ethernet (eth0) allows you to open the operation menu of the board in a Web browser on your PC, tablet, or smartphone on the same LAN.

See “7.6.3 Verifying the network settings” for an explanation of how to verify the IP address.

Open the browser on your windows PC and then enter the IP address of the CEV-RZ/A1L board.

This operation has been confirmed to work correctly with Google Chrome 28, Mozilla Firefox 23, and Internet Explorer 10.

Enter the Ethernet (eth0) IP address of this board in the address bar of the Web browser.

The Web application menu for the CEV-RZ/A1L opens.



8.2 Web application operation navigator

A menu called "Operation Navigator" is displayed on the Web applications.

8.2.1 Sensor control

Sensor control is an application for controlling sensors that can be installed on the CEV-RZ/A1L board.

Home monitoring application demo

When combined with a thermistor, humidity sensor, CT sensor, pyroelectric sensor, and gas sensor, the AD converter (AN4-AN7) of the RZ/A1L displays temperature, humidity, power consumption, intruder presence, gas leakage detection, heatstroke, and discomfort level.

The value of each sensor is displayed by reading the data with JavaScript in an HTML file.
The data is frequently updated by the application.

Display content	Sensor	AD converter	HTML file	Application	Data
temperature	thermistor	AN4	sensor-test.html	sensor-json	/tmp/sensor-json.dat
humidity	humidity ^{*2}	AN5		sensor-log	/tmp/sensor-pyroelectric.dat
power consumption	CT ^{*2}	AN6		sensor-json	/tmp/sensor-json.dat
intruder presence	pyroelectric ^{*2}	AN7 ^{*1}			
gas leakage detection	gas ^{*2}	AN7 ^{*1}			
heatstroke	thermistor	AN4			
discomfort level	thermistor humidity ^{*2}	AN4, AN5			

*1 The AN7 can be connected to either the pyroelectric sensor or the gas sensor. You cannot use both with the AN7 simultaneously.

*2 None of the sensors, except for the thermistor, are built-in by default. If necessary, install them as explained in the hardware manual.



If you install the humidity, CT, and pyroelectric sensors, along with the built-in thermistor, the data are shown as follows:



The value will be indefinite if you select a sensor that is not installed.

RZ/A1L built-in A/D converter monitor

It monitors the value of the RZ/A1L built-in A/D converter.

It displays the value (12 bits) of the A/D converter (AN4-AN7) at intervals of 1 second.

RZ/A1L built-in A/D converter logger

It displays the value of the RZ/A1L built-in A/D converter, which are monitored at intervals of 100 seconds.

8.2.2 Changing date and time

You can change the date and time on the RZ/A1L.

At power-on, the clock starts at 00:00:00 on January 1, 1970.



Specify the year, month, and day with an 8-digit number in the left text box.

For August 1, 2013, enter "20130801".

Specify the time with a 6-digit number in the right text box.

For 9:35:30, enter "093530".

Click the **[設定する]** button to immediately reflect the date and time change on the board.

The date and time cannot be stored by the board because it does not have a battery for backup.

8.2.3 LED control

The board has two LEDs that can be turned on and off through the GPIO. Clicking the LED control displays LED-shaped icons.



The icon indicates the current LED status (on/off). In the above picture, LED 1 is off while LED 2 is on. The icon can be flipped on/off by clicking, causing the LED status on the board to be the same as that of the icon.

8.2.4 IP address settings

Select **[IP アドレスの設定]** on the operation navigator.

You can set up the Ethernet (eth0) IP address.



By default, an IP address is obtained from the DHCP server.

Set this according to your home network environment.

To set a static IP address, configure "IP address", "net mask", "network", "broadcast", and "gateway" properly according to your network environment.

Static IP configuration example

IP アドレス	192.168.0.1
ネットマスク	255.255.255.0
ネットワーク	192.168.0.0
ブロードキャスト	192.168.0.255
ゲートウェイ	192.168.0.1

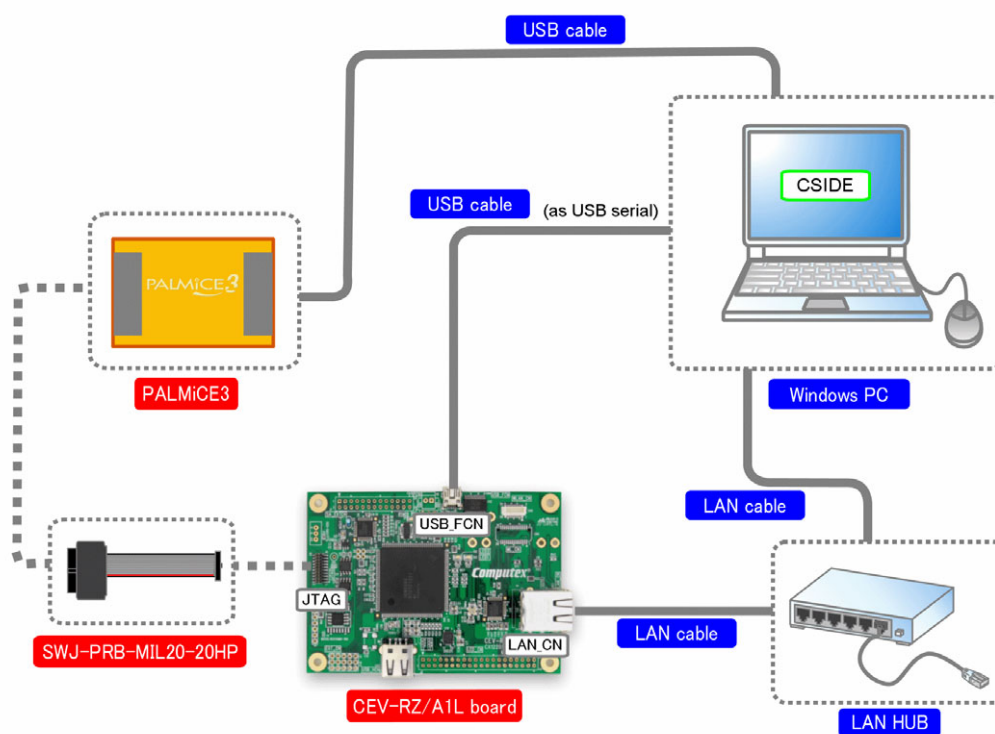
Chapter 9 Debugging using PALMiCE3

9.1 Introduction

This chapter describes how to debug using Computex JTAG emulator PALMiCE3 ARM and Linux-APDLIB from the option library. You must have the separate "SWJ-PRB-MIL20-20HP" JTAG probe installed to connect the PALMiCE3 to the CEV-RZ/A1L board.

9.2 Connecting the hardware

Connect your Windows host PC to the PALMiCE3 and the CEV-RZ/A1L board, as follows:

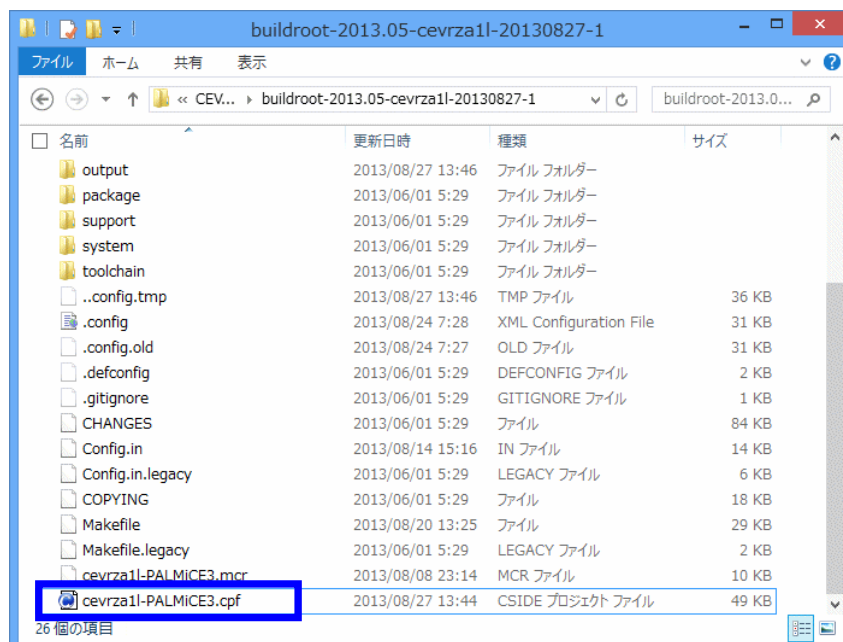


9.3 Starting CSIDE

The CEV Linux SDK includes the PALMiCE3 project file required for debugging using the PALMiCE3 in the CEV Linux SDK folder.

Double-click the project file in the CEV Linux SDK folder shared with Ubuntu on VMware Player to launch CSIDE. The CSIDE project file can be found in the following directory of the CEV Linux SDK:

~/CEV_Linux_SDK_{version}/buildroot-{version}/{Board name}-PALMiCE3.cpf



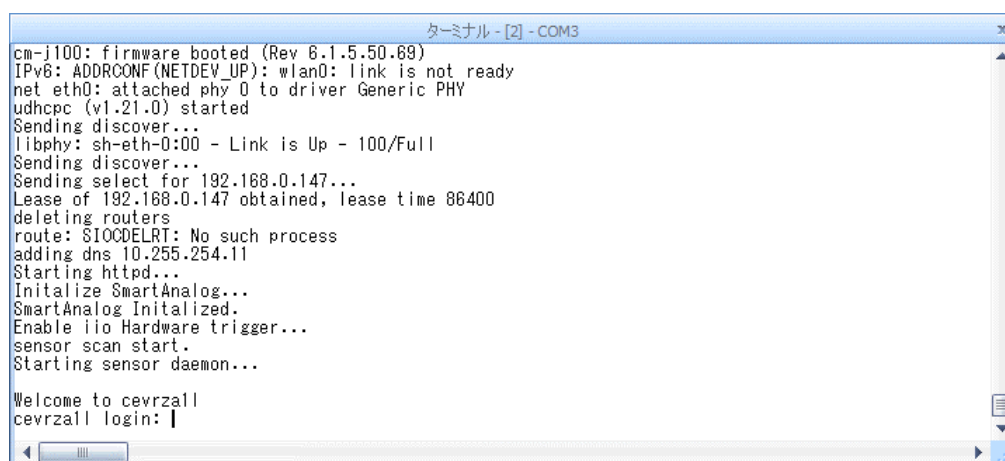
Once CSIDE has been launched, the program is ready to run.

If you select **[実行][実行]** from the menu, the program runs and U-Boot starts.

To boot Linux, enter the following command:

```
U-BOOT> run usbboot
```

When Linux is booted, the login prompt is displayed.



9.4 Linux debug mode

To debug in Linux debug mode, verify the following:

- A license for Linux-APDLIB (Linux application debug library) is required.
- Apply the patch to the kernel to enable all the features supported in Linux debug mode.
- To enter Linux debug mode, load the kernel debug information (vmlinux).
- After entering Linux debug mode, configure the Linux debug settings.

9.4.1 Introducing Linux-APDLIB

Linux-APDLIB (Linux application debug library) is an optional product of PALMiCE3 ARM.

After purchasing the Linux-APDLIB, use the license application wizard to validate the Linux-APDLIB license.

9.4.2 Applying the kernel patch

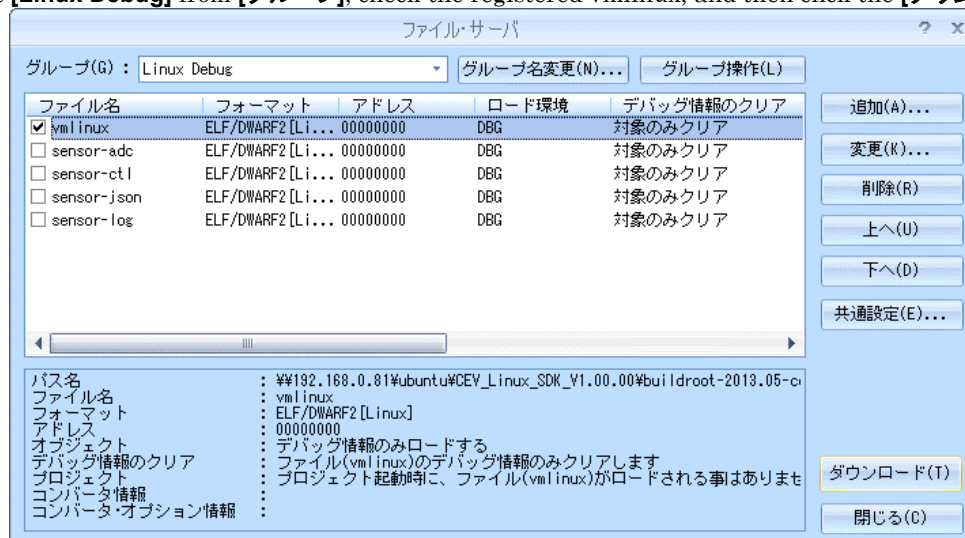
The kernel patch is applied to the CEV Linux SDK by default, enabling debugging with the PALMiCE3. Follow the steps below to switch between the enable/disable states for applying the patch.

1. Enter the following command from Buildroot to display the kernel configuration:
ubuntu@ubuntu:~/CEV_Linux_SDK_{version}/buildroot-{version}\$ make linux-menuconfig
2. Select the following item from the Linux kernel configuration:
Computex Linux dbglib --->
[*] Computex linux debug library support
3. Use the check box for the above item to switch between the enable/disable states for applying the PALMiCE3 kernel patch.

9.4.3 Loading vmlinux debug information

Select **[ファイル][ロード]** from the CSIDE menu to open the file server.

Select **[Linux Debug]** from **[グループ]**, check the registered vmlinux, and then click the **[ダウンロード]** button.



After booting the kernel on CSIDE and verifying that it is running, select **[ファイル][Linux デバッグモード]** from the menu.

9.4.4 Linux debug settings

If you are not using the CSIDE project file (extension: cpf) provided by SDK, select the **[Linux デバッグ設定]** tab from **[CSIDE の設定]** on the menu in order to perform set up.

Select **[Linux デバッグ用パッチを使用してデバッグする]**.

Select **[Generic Linux 2.6.18 ARM]** for **[LSP アーキテクチャ名]**.

9.5 Debugging a kernel/loadable module

To debug a kernel, load vmlinux with the debug information.

To debug a loadable module, compile the loadable module (*.ko) that you want to debug with the debug information, and load only the debug information from CSIDE.

You can debug a loadable module by loading it into modprobe {loadable module.ko}.

9.6 Debugging an application

To debug an application, compile an application that you want to debug with the debug information, and load only the debug information from CSIDE.

If you run an application on the CEV-RZ/A1L board, you can perform debugging by breaking in the main() function of the application into which the debug information was loaded.

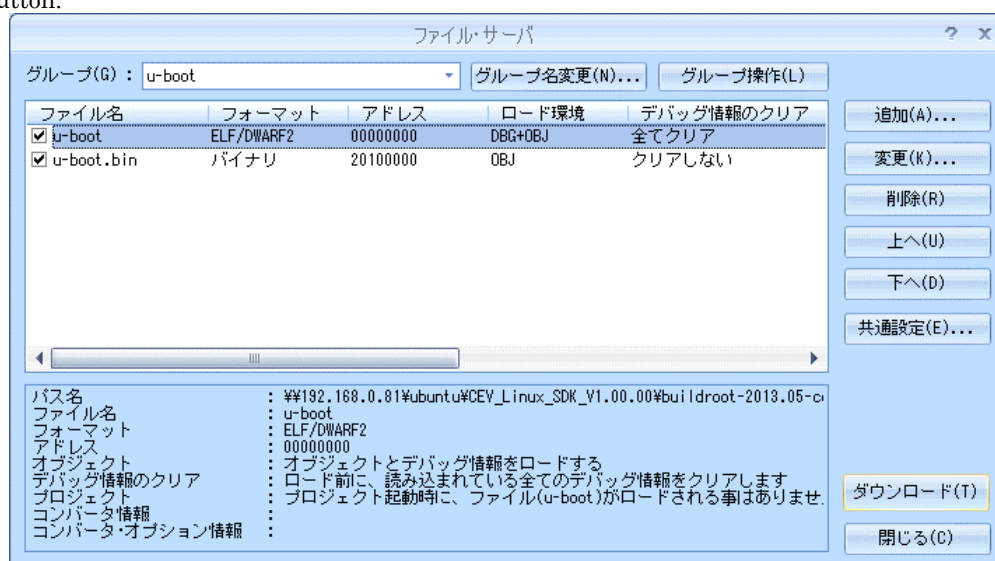
9.7 Restoring U-Boot

U-Boot starts at power on as it is pre-loaded into the SPI flash on the CEV-RZ/A1L board by default. If this SPI flash is erased for some reason, the CEV-RZ/A1L board cannot itself restore U-Boot. Should this occur, it must be restored using a JTAG-ICE, such as Computex PALMiCE3. U-Boot is reloaded using the following procedure:

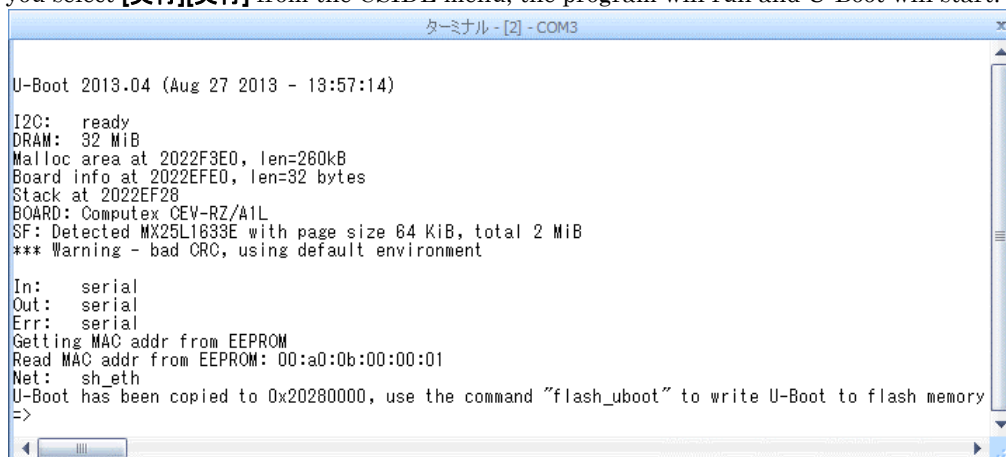
Select **[システム][ハードウェアの初期化]** from the CSIDE menu to initialize the hardware.

Then, select **[ファイル][ロード]** from the CSIDE menu to open the file server.

Select **[u-boot]** from **[グループ]**, check the registered u-boot and u-boot.bin, and then click the **[ダウンロード]** button.



If you select **[実行][実行]** from the CSIDE menu, the program will run and U-Boot will start.

A terminal window titled 'ターミナル - [2] - COM3' showing the U-Boot startup process. The output includes hardware information like I2C, DRAM, and board details for a Computex CEV-RZ/A1L. It also shows a warning about a bad CRC and the successful copying of U-Boot to flash memory at address 0x20280000.

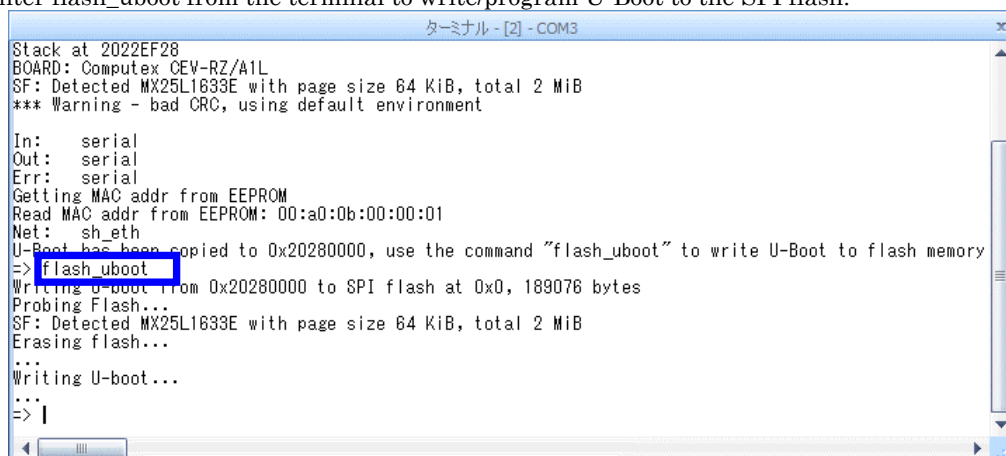
```
ターミナル - [2] - COM3

U-Boot 2013.04 (Aug 27 2013 - 13:57:14)

I2C: ready
DRAM: 32 MiB
Malloc area at 2022F3E0, len=260kB
Board info at 2022EFE0, len=32 bytes
Stack at 2022EF28
BOARD: Computex CEV-RZ/A1L
SF: Detected MX25L1633E with page size 64 KiB, total 2 MiB
*** Warning - bad CRC, using default environment

In: serial
Out: serial
Err: serial
Getting MAC addr from EEPROM
Read MAC addr from EEPROM: 00:a0:0b:00:00:01
Net: sh_eth
U-Boot has been copied to 0x20280000, use the command "flash_uboot" to write U-Boot to flash memory
=>
```

Enter flash_uboot from the terminal to write/program U-Boot to the SPI flash.

A terminal window titled 'ターミナル - [2] - COM3' showing the execution of the 'flash_uboot' command. The command is entered and executed, resulting in the U-Boot image being written to the SPI flash at address 0x0. The output shows the progress of writing and the final state of the flash.

```
ターミナル - [2] - COM3

Stack at 2022EF28
BOARD: Computex CEV-RZ/A1L
SF: Detected MX25L1633E with page size 64 KiB, total 2 MiB
*** Warning - bad CRC, using default environment

In: serial
Out: serial
Err: serial
Getting MAC addr from EEPROM
Read MAC addr from EEPROM: 00:a0:0b:00:00:01
Net: sh_eth
U-Boot has been copied to 0x20280000, use the command "flash_uboot" to write U-Boot to flash memory
=> flash_uboot
Writing U-Boot from 0x20280000 to SPI flash at 0x0, 189076 bytes
Probing Flash...
SF: Detected MX25L1633E with page size 64 KiB, total 2 MiB
Erasing flash...
...
Writing U-boot...
...
=> |
```

Chapter 10 Software included in the CEV Linux SDK

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For this product, the licenses are classified based on the license format, as follows:

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10.1.1 Source package list

This is a list of source packages included in the CEV-RZ/A1L package.

These are used as templates for the licenses. Therefore, they do not contain either software names or author names. For software licenses, refer to the license terms provided with each software package.

[Source package]	[License]
buildroot-2013.05.tar.bz2	GPLv2, LGPLv2
busybox-1.21.0.tar.bz2	GPLv2
eeprog-0.7.6.tar.gz	GPLv2
gdb-7.5.1.tar.bz2	GPLv2, GPLv3
autoconf-2.68.tar.gz	GPLv2, GPLv3
automake-1.11.6.tar.gz	GPLv2
bison-2.7.1.tar.gz	GPLv3
e2fsprogs-1.42.7.tar.gz	GPLv2
expat-2.1.0.tar.gz	MIT/X Consortium License
fakeroot_1.18.2.orig.tar.bz2	GPLv3
flex-2.5.37.tar.gz	BSD 3-Clause License
genext2fs-1.4.1.tar.gz	GPLv2
libtool-2.2.10.tar.gz	GPLv2
lzo-2.06.tar.gz	GPLv2
lzop-1.03.tar.gz	GPLv2
m4-1.4.16.tar.bz2	GPLv3
module-init-tools-3.15.tar.bz2	GPLv2
ncurses-5.9.tar.gz	GPLv2
pkgconf-0.8.9.tar.bz2	GPLv2
iperf-2.0.5.tar.gz	GPLv2
iptables-1.4.18.tar.bz2	GPLv2
iw-3.10.tar.bz2	none
libdaemon-0.14.tar.gz	LGPLv2.1
libffi-3.0.13.tar.gz	GPLv2, LGPLv2.1, GPLv3, LGPLv3.0
libgcrypt-1.5.2.tar.bz2	GPLv2, LGPLv2.1
libgpg-error-1.10.tar.gz	GPLv2, LGPLv2.1
libnl-3.2.21.tar.gz	LGPLv2.1
libpcap-1.3.0.tar.gz	BSD 3-Clause License
libxml2-2.9.0.tar.gz	LGPLv2.1, MIT
linux-3.8.13.tar.bz2	GPLv2
openssl-1.0.1e.tar.gz	OpenSSL
sqlite-autoconf-3071401.tar.gz	http://www.sqlite.org/copyright.html
u-boot-2013.04.tar.bz2	GPLv2
wireless_tools.29.tar.gz	GPLv2
wpa_supplicant-2.0.tar.gz	BSD 3-Clause License, GPLv2
zlib-1.2.7.tar.bz2	The zlib/libpng License (Zlib)
gcc-4.7.3.tar.bz2	GPLv2, LGPLv2.1, GPLv3, LGPLv3.0

gcc-linaro-arm-linux-gnueabi-4.7-2013.01-20130125_src.tar.bz2	GPLv2 , LGPLv2.1 , GPLv3 , LGPLv3.0
ethtool-3.9.tar.gz	GPLv2
XML-Parser-2.36.tar.gz	none
argus_3.0.0.rc.34.orig.tar.gz	GPLv2
avahi-0.6.31.tar.gz	LGPLv2.1
bind-9.6-ESV-R8.tar.gz	BSD 3-Clause License, GPLv2, OpenSSL
binutils-2.21.1.tar.bz2	GPLv2 , LGPLv2 , GPLv3 , LGPLv3.0
gettext-0.18.2.1.tar.gz	GPLv3
glib-2.30.3.tar.xz	LGPLv2
gmp-5.1.1.tar.bz2	GPLv3 , LGPLv3.0
intltool-0.40.6.tar.bz2	GPLv2
iproute2-3.7.0.tar.gz	GPLv2
ipsec-tools-0.8.0.tar.bz2	BSD 3-Clause License, GPLv2
ipset-6.18.tar.bz2	GPLv2
libmnl-1.0.3.tar.bz2	LGPLv2.1
lighttpd-1.4.32.tar.gz	BSD 3-Clause License, GPLv2
mpc-1.0.1.tar.gz	LGPLv3.0
mpfr-3.1.2.tar.bz2	GPLv3 , LGPLv3.0
ntp-4.2.6p5.tar.gz	Open Source License
tcpdump-4.3.0.tar.gz	BSD 3-Clause License
tcpdump-3.4.3.tar.gz	BSD 3-Clause License
uClibc-0.9.33.2.tar.bz2	LGPLv2.1
wireshark-1.8.7.tar.bz2	GPLv2

Licenses used for multiple packages are called combination licenses.

10.1.2 License

The license obtained from Buildroot is as follows:

```
~/buildroot-{version} $ make legal-info
```

```
.....
buildroot: COPYING file
.....
```

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Version 3, 29 June 2007

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.....:

hostapd: README file

.....:

wpa_supplicant and hostapd

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Source code files were moved around in v0.6.x releases and compared to earlier releases, the programs are now built by first going to a subdirectory (wpa_supplicant or hostapd) and creating build configuration (.config) and running 'make' there (for Linux/BSD/cygwin builds).

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- b) Use a suitable shared library mechanism for linking with the Library. A suitable mechanism is one that (1) uses at run time a copy of the library already present on the user's computer system, rather than copying library functions into the executable, and (2) will operate properly with a modified version of the library, if the user installs one, as long as the modified version is interface-compatible with the version that the work was made with.
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We call this license the "Lesser" General Public License because it does Less to protect the user's freedom than the ordinary General Public License. It also provides other free software developers Less of an advantage over competing non-free programs. These disadvantages are the reason we use the ordinary General Public License for many libraries. However, the Lesser license provides advantages in certain special circumstances.

For example, on rare occasions, there may be a special need to encourage the widest possible use of a certain library, so that it becomes a de-facto standard. To achieve this, non-free programs must be allowed to use the library. A more frequent case is that a free library does the same job as widely used non-free libraries. In this case, there is little to gain by limiting the free library to free software only, so we use the Lesser General Public License.

In other cases, permission to use a particular library in non-free programs enables a greater number of people to use a large body of free software. For example, permission to use the GNU C Library in non-free programs enables many more people to use the whole GNU operating system, as well as its variant, the GNU/Linux operating system.

Although the Lesser General Public License is Less protective of the users' freedom, it does ensure that the user of a program that is linked with the Library has the freedom and the wherewithal to run that program using a modified version of the Library.

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A "library" means a collection of software functions and/or data prepared so as to be conveniently linked with application programs (which use some of those functions and data) to form executables.

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d) If a facility in the modified Library refers to a function or a table of data to be supplied by an application program that uses the facility, other than as an argument passed when the facility is invoked, then you must make a good faith effort to ensure that, in the event an application does not supply such function or table, the facility still operates, and performs whatever part of its purpose remains meaningful.

(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Library, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Library, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Library.

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If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

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If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

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.....
ncurses: README file
.....
```

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-----
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```
-----
-- $Id: README,v 1.23 2006/04/22 22:19:37 tom Exp $
-----
```

README file for the ncurses package

See the file ANNOUNCE for a summary of ncurses features and ports.
 See the file INSTALL for instructions on how to build and install ncurses.
 See the file NEWS for a release history and bug-fix notes.
 See the file TO-DO for things that still need doing, including known bugs.

Browse the file misc/ncurses-intro.html for narrative descriptions of how to use ncurses and the panel, menu, and form libraries.

Browse the file doc/html/hackguide.html for a tour of the package internals.

ROADMAP AND PACKAGE OVERVIEW:

You should be reading this file in a directory called: ncurses-d.d, where d.d is the current version number (see the dist.mk file in this directory for that). There should be a number of subdirectories, including 'c++', 'form', 'man', 'menu', 'misc', 'ncurses', 'panel', 'progs', 'test', 'tack' and 'Ada95'. (The 'tack' program may be distributed separately).

A full build/install of this package typically installs several libraries, a handful of utilities, and a database hierarchy. Here is an inventory of the pieces:

The libraries are:

libncurses.a	(normal)
libncurses.so	(shared)
libncurses_g.a	(debug and trace code enabled)
libncurses_p.a	(profiling enabled)
libpanel.a	(normal)
libpanel.so	(shared)
libpanel_g.a	(debug and trace code enabled)
libmenu.a	(normal)
libmenu.so	(shared)
libmenu_g.a	(debug enabled)
libform.a	(normal)
libform.so	(shared)
libform_g.a	(debug enabled)

If you configure using the `--enable-widex` option, a "w" is appended to the library names (e.g., `libncursesw.a`), and the resulting libraries support wide-characters, e.g., via a UTF-8 locale. The corresponding header files are compatible with the non-wide-character configuration; wide-character features are provided by `ifdef's` in the header files. The wide-character library interfaces are not binary-compatible with the non-wide-character version.

The ncurses libraries implement the curses API. The panel, menu and forms libraries implement clones of the SVr4 panel, menu and forms APIs. The source code for these lives in the ``ncurses'`, ``panel'`, ``menu'`, and ``form'` directories respectively.

In the ``c++'` directory, you'll find code that defines an interface to the curses, forms, menus and panels library packaged as C++ classes, and a demo program in C++ to test it. These class definition modules are not installed by the `'make install.libs'` rule as `libncurses++`.

In the ``Ada95'` directory, you'll find code and documentation for an Ada95 binding of the curses API, to be used with the GNAT compiler. This binding is built by a normal top-level `'make'` if configure detects an usable version of GNAT (3.11 or above). It is not installed automatically. See the Ada95 directory for more build and installation instructions and for documentation of the binding.

To do its job, the ncurses code needs your terminal type to be set in the environment variable `TERM` (normally set by your OS; under UNIX, `getty(1)` typically does this, but you can override it in your `.profile`); and, it needs a database of terminal descriptions in which to look up your terminal type's capabilities.

In older (V7/BSD) versions of curses, the database was a flat text file, `/etc/termcap`; in newer (USG/USL) versions, the database is a hierarchy of fast-loading binary description blocks under `/usr/lib/terminfo`. These binary blocks are compiled from an improved editable text representation called ``terminfo'` format (documented in `man/terminfo.5`). The ncurses library can use either `/etc/termcap` or the compiled binary `terminfo` blocks, but prefers the second form.

In the ``misc'` directory, there is a text file `terminfo.src`, in editable `terminfo` format, which can be used to generate the `terminfo` binaries (that's what `make install.data` does). If the package was built with the `--enable-termcap` option enabled, and the ncurses library cannot find a `terminfo` description for your terminal, it will fall back to the `termcap` file supplied with your system (which the ncurses package installation leaves strictly alone).

The utilities are as follows:

```
tic          -- terminfo source to binary compiler
infocmp      -- terminfo binary to source decompiler/comparator
clear        -- emits clear-screen for current terminal
tput         -- shell-script access to terminal capabilities.
toe          -- table of entries utility
tset         -- terminal-initialization utility
```

The first two (`tic` and `infocmp`) are used for manipulating `terminfo` descriptions; the next two (`clear` and `tput`) are for use in shell scripts. The

last (tset) is provided for 4.4BSD compatibility. The source code for all of these lives in the 'progs' directory.

Detailed documentation for all libraries and utilities can be found in the 'man' and 'doc' directories. An HTML introduction to ncurses, panels, and menus programming lives in the 'doc/html' directory. Manpages in HTML format are under 'doc/html/man'.

The 'test' directory contains programs that can be used to verify or demonstrate the functions of the ncurses libraries. See test/README for descriptions of these programs. Notably, the 'ncurses' utility is designed to help you systematically exercise the library functions.

AUTHORS:

Pavel Curtis:

wrote the original ncurses

Zeyd M. Ben-Halim:

port of original to Linux and many enhancements.

Thomas Dickey (maintainer for 1.9.9g through 4.1, resuming with FSF's 5.0):

configuration scripts, porting, mods to adhere to XSI Curses in the areas of background color, terminal modes. Also memory leak testing, the wresize, default colors and key definition extensions and numerous bug fixes (more than half of those enumerated in NEWS beginning with the internal release 1.8.9).

Florian La Roche (official maintainer for FSF's ncurses 4.2)

Beginning with release 4.2, ncurses is distributed under an MIT-style license.

Eric S. Raymond:

the man pages, infocmp(1), tput(1), clear(1), captinfo(1), tset(1), toe(1), most of tic(1), trace levels, the HTML intro, wgetnstr() and many other entry points, the cursor-movement optimization, the scroll-pack optimizer for vertical motions, the mouse interface and xterm mouse support, and the ncurses test program.

Juergen Pfeifer

The menu and form libraries, C++ bindings for ncurses, menus, forms and panels, as well as the Ada95 binding. Ongoing support for panel.

CONTRIBUTORS:

Alexander V. Lukyanov

for numerous fixes and improvements to the optimization logic.

David MacKenzie

for first-class bug-chasing and methodical testing.

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for help, criticism, comments, bug-finding, and being willing to
deep-six BSD curses for this one when it grew up.

Richard Stallman,
for his commitment to making ncurses free software.

Countless other people have contributed by reporting bugs, sending fixes,
suggesting improvements, and generally whining about ncurses :-)

BUGS:

See the INSTALL file for bug and developer-list addresses.
The Hacker's Guide in the doc directory includes some guidelines
on how to report bugs in ways that will get them fixed most quickly.

```
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.....:
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The following individuals contributed in part to the Network Time

Protocol Distribution Version 4 and are acknowledged as authors of this work.

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3. [3]Bernd Altmeier <altmeier@atlsoft.de> hopf Elektronik serial line and PCI-bus devices
4. [4]Viraj Bais <vbais@mailman1.intel.com> and [5]Clayton Kirkwood <kirkwood@striderfm.intel.com> port to WindowsNT 3.5
5. [6]Michael Barone <michael.barone@lmco.com> GPSVME fixes
6. [7]Karl Berry <karl@owl.HQ.ileaf.com> syslog to file option
7. [8]Greg Brackley <greg.brackley@bigfoot.com> Major rework of WINNT port. Clean up recvbuf and iosignal code into separate modules.
8. [9]Marc Brett <Marc.Brett@westgeo.com> Magnavox GPS clock driver
9. [10]Piete Brooks <Piete.Brooks@cl.cam.ac.uk> MSF clock driver, Trimble PARSE support
10. [11]Nelson B Bolyard <nelson@bolyard.me> update and complete broadcast and crypto features in snpt
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- discipline, authentication, precision kernel; clock drivers:
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46. [50]Nick Sayer <mrapple@quack.kfu.com> SunOS streams modules
47. [51]Jack Sasportas <jack@innovativeinternet.com> Saved a Lot of
space on the stuff in the html/pic/ subdirectory
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makeover, various other bits (see the ChangeLog)
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 31. mailto:%20kardel(at)ntp(dot)org
 32. mailto:%20jones@hermes.chpc.utexas.edu
 33. mailto:%20dkatz@cisco.com
 34. mailto:%20leres@ee.lbl.gov
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```

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```

.....:
wpa_supplicant: README file
.....:

```

```

wpa_supplicant and hostapd
-----

```

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file for more instructions.

This package may include either wpa_supplicant, hostapd, or both. See
README file respective subdirectories (wpa_supplicant/README or
hostapd/README) for more details.

Source code files were moved around in v0.6.x releases and compared to
earlier releases, the programs are now built by first going to a
subdirectory (wpa_supplicant or hostapd) and creating build
configuration (.config) and running 'make' there (for Linux/BSD/cygwin
builds).

```

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.....:

zlib: README file

.....:

ZLIB DATA COMPRESSION LIBRARY

zlib 1.2.8 is a general purpose data compression library. All the code is thread safe. The data format used by the zlib library is described by RFCs (Request for Comments) 1950 to 1952 in the files <http://tools.ietf.org/html/rfc1950> (zlib format), [rfc1951](http://tools.ietf.org/html/rfc1951) (deflate format) and [rfc1952](http://tools.ietf.org/html/rfc1952) (gzip format).

All functions of the compression library are documented in the file `zlib.h` (volunteer to write man pages welcome, contact zlib@gzip.org). A usage example of the library is given in the file `test/example.c` which also tests that the library is working correctly. Another example is given in the file `test/minigzip.c`. The compression library itself is composed of all source files in the root directory.

To compile all files and run the test program, follow the instructions given at the top of `Makefile.in`. In short `./configure; make test`, and if that goes well, `make install` should work for most flavors of Unix. For Windows, use one of the special makefiles in `win32/` or `contrib/vstudio/`. For VMS, use `make_vms.com`.

Questions about zlib should be sent to [<zlib@gzip.org>](mailto:zlib@gzip.org), or to Gilles Vollant [<info@winimage.com>](mailto:info@winimage.com) for the Windows DLL version. The zlib home page is <http://zlib.net/>. Before reporting a problem, please check this site to verify that you have the latest version of zlib; otherwise get the latest version and check whether the problem still exists or not.

PLEASE read the zlib FAQ http://zlib.net/zlib_faq.html before asking for help.

Mark Nelson [<markn@ieee.org>](mailto:markn@ieee.org) wrote an article about zlib for the Jan. 1997 issue of Dr. Dobbs's Journal; a copy of the article is available at <http://marknelson.us/1997/01/01/zlib-engine/>.

The changes made in version 1.2.8 are documented in the file `ChangeLog`.

Unsupported third party contributions are provided in directory `contrib/`.

zlib is available in Java using the `java.util.zip` package, documented at <http://java.sun.com/developer/technicalArticles/Programming/compression/>.

A Perl interface to zlib written by Paul Marquess [<pmqs@cpan.org>](mailto:pmqs@cpan.org) is available at CPAN (Comprehensive Perl Archive Network) sites, including <http://search.cpan.org/~pmqs/IO-Compress-Zlib/>.

A Python interface to zlib written by A.M. Kuchling [<amk@amk.ca>](mailto:amk@amk.ca) is available in Python 1.5 and later versions, see <http://docs.python.org/library/zlib.html>.

zlib is built into tcl: <http://wiki.tcl.tk/4610>.

An experimental package to read and write files in .zip format, written on top

of zlib by Gilles Vollant <info@winimage.com>, is available in the contrib/minizip directory of zlib.

Notes for some targets:

- For Windows DLL versions, please see win32/DLL_FAQ.txt
- For 64-bit Irix, deflate.c must be compiled without any optimization. With -O, one libpng test fails. The test works in 32 bit mode (with the -n32 compiler flag). The compiler bug has been reported to SGI.
- zlib doesn't work with gcc 2.6.3 on a DEC 3000/300LX under OSF/1 2.1 it works when compiled with cc.
- On Digital Unix 4.0D (formerly OSF/1) on AlphaServer, the cc option -std1 is necessary to get gzprintf working correctly. This is done by configure.
- zlib doesn't work on HP-UX 9.05 with some versions of /bin/cc. It works with other compilers. Use "make test" to check your compiler.
- gzdopen is not supported on RISCOS or BEOS.
- For PalmOs, see <http://palmzlib.sourceforge.net/>

Acknowledgments:

The deflate format used by zlib was defined by Phil Katz. The deflate and zlib specifications were written by L. Peter Deutsch. Thanks to all the people who reported problems and suggested various improvements in zlib; they are too numerous to cite here.

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Jean-loup Gailly Mark Adler
jloup@gzip.org madler@alumni.caltech.edu

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-- Wolfgang Denk

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